SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE IRONWORKS AND COLLIERIES IN YORKSHIRE.

THE SWAITHE AND EDMUND'S MAIN COLLIERIES.

IMPROVED METHODS OF PUTTING IN AND TAKING OFF CORVES FROM TWO-DECKED MINING CAGES.

Worsborough Dale, situate about two miles from Barnsley, may be said to be the heart of the South Yorkshire coal field, for within it and its immediate neighbourhood the well-known and valuable Nine-feet seam has been more extensively worked than in any other part of it. It is true that long chimnies vomiting masses of dark smoke and colliery head-gearing are not the most pleasing adjuncts to a picture, nor do they add much to the beauty of a landscape, yet from the ridge which tops the dale of Worsborough is to be seen some of the most charming scenery to be found in almost any part of Yorkshire, and as such has often furnished material for the works of some of our most eminent artists. The ground, too, is rich in historical associations, for no inconsiderable portion of it, and, of course, the minerals, at one time belonged to the great, but unfortunate, Lord Strafford, the site of whose mansion is now crowned by Wentworth Castle, the residence of Mr. T. W. V. T. Wentworth, and, situate on the crest of a hill, stands out in bold relief, being visible from almost any part of Worsborough. On another side the trees of Wombwell Wood and Worsborough Park shelter the dale, whilst in the background are the new church, grassy slopes, with well cultivated fields, and a fine avenue of trees leading to Swaithe.

In the bottom part of the dale is the Edmund's Main Colliery, which is connected with that of Swaithe Main, the distance from the shaft of the one to the other being about one mile. The junction between the two collieries took place early in December, 1862, when an explosion of gas occurred, by which fifty-nine persons were killed. The coal having caught fire it was found necessary to "drown" it out, and so sealed up it remained until the following June, when the bodies left in were gradually recovered. Since that period the pit has been successfully worked, and at the present time is comparatively free from gas, so much so that naked lights are now used in it. The pit bank is supported on cast-iron columns, and there are two sets of head-gearing instead of a double one, so that the cages come up singly from two shafts. The gearing is about 56 ft. high, the pullies being 9 ft. in diameter, and the cages single-decked. There are two drawing shafts and an upcast, the depth from the surface being about 105 yards. One drawing-shaft is 10 ft. in diameter, the other 8 ft., and the upcast 9 ft., all being bricked to the bottom. The engine-room is spacious and clean, and close to one of the shafts. After the accident of 1862 an artist from the *Illustrated News* was sketching in the room named when an explosion took place, enveloping him in smoke and steam, much to his astonishment, when he beat a hasty retreat, and never returned to the scene he had so precipitately quitted. The Marquis of Townsend also visited the place about the same time, being on a philanthropic mission through the North of England. However, to return to the machinery, we may say that there are a pair of 30-horse power winding-engines, with 20-in. cylinders, 4-ft. stroke. The boilers, seven in number, are of the ordinary cylindrical type, 33 ft. in length and 5 ft. in diameter. In the same room there is also a pumping-engine of 30-horse power, but it is not much required, seeing that very little water is made. At the bottom of the pit there are a pair of well-appointed drawing engines by Mr. J. Mitchell, jun., of the Worsborough Ironworks, which draw a load of 16 ½-cwt. corves along the inclines, a distance of about 1000 yards, in rather less than five minutes. The motive-power is obtained by a 20-horse boiler placed in close proximity to the ventilating furnace. The furnace is somewhat differently placed to what is usual, being brought back from the upcast shaft, so as to form a dumb-drift. From the engine-room at the bottom of the pit communication is maintained with several parts of the workings to the extent of 1000 yards each way by means of a telegraph signal fitted up by Bailey, of Wakefield, and which acts admirably. The system adopted in getting the coal is that known as "bords" and "banks," the bords being driven so as to leave wide pillars, and has answered remarkably well, ensuring, as it does, good air-roads. At the Edmunds Main there are excellent transit facilities, the coal being sent both by rail and water.

The Swaithe Main Colliery is situate quite close to the canal, an advantage to the proprietors, but not at all times to some of the men, seeing that not so very long since an obnoxious workman was thrown into it by some of his fellows, but was fortunate enough to be rescued alive. In connection with the colliery, however, there are some specialities deserving of notice. The pit hill is supported by means of cast-iron columns, so as to leave free access to the mouth of the shaft, the cages at present being single-decked ones, drawing two corves containing ¼ ton of coal each; but, as Mr. John Mitchell has recently introduced an improved method of putting on and taking off corves from two-decked mining cages, that system will be brought into operation. The particulars relating to it will, however, be noticed hereafter. The head-gearing is of a massive character, made of pitch pine, and is 56 ft. in height, carrying a pair of 17-ft. pulleys. Lamps only are used in the pit, the cabin being at the top. For the purpose of raising the loaded corves from the bottom there are a pair of drawing-engines, each of about 60-horse power, the diameter of the cylinders being 26 in., with a 17-ft. drum. Nine cylindrical boilers, 33 ft. long and 5 ft. in diameter, supply the power required. In connection with one of the shafts, of which there are two, there are peculiarities of some interest. The drawing-shaft is 13 ft. in diameter at the top, as is also the upcast, but the latter increases to 16 ft. at the bottom. The ventilating-furnace is put quite close to the bottom of the shaft, there being a chimney with wrought-iron casing built to a height of 40 yards up the shaft, by which means the return air is brought in at the bottom, between the pit wall and the external diameter of the casing, and so obtaining fully as good results as by the ordinary open furnace, without the danger of bringing the return air on to the fire. The system is now being adopted at several places where the open furnace has been in use, and Mr. John Mitchell has been for some time engaged in preparing plans for collieries where it will supersede the old method. The depth of the drawing-shaft from the surface to the coal is about 230 yards, the coal being about 8 ft. 6 in. thick, and of good quality, comprising both steam and house qualities.

The following is a reduced section of the strata :—

	yds.	ft.	in.
Soil and rag	4	0	0
Wath Wood or Melton rock	42	0	0
Distance	12	2	6
Melton or Wath Wood coal	0	3	6
Distance	23	0	3
Abdy coal	0	2	9
Distance	31	1	0
Kent thin coal	0	2	0
Distance	12	0	0
Rock, with shale	18	0	0
Distance	11	0	0
Kent thick coal, in beds	0	3	4
Distance	44	0	0
Ten-inch bed of coal	0	1	2
Distance	20	0	0
Barnsley boulder	3	0	0
Bind, with ironstone	1	2	0
Barnsley thick coal	0	8	6
Total	230	0	0

The hauling-engines are at the top, and consist of a pair of 20-in. cylinders of 30-horse power each, with 4-ft. stroke, connected by steel ropes to the load in the incline, the coal being worked to the rise by means of self-acting inclines, and to the dips by a spacious engine-plane. At the bottom of the pits there are a pair of ram-pumps of rather peculiar construction, by Mr. J. Mitchell, jun., who has paid a great deal of attention to machinery adapted for colliery purposes, and in which he has had a great deal of experience. The plungers of the rams are 14 in. in diameter, 3 ft. 6 in. stroke, worked by two sets of spears from the top, attached to wrought-iron beams. The weight of each set of spears is from 14 to 15 tons. Each lift forces the water up a distance of 185 yards, at the rate of seven strokes a minute, drawing out about 30,000 gallons of water per hour. The lessors of the coal now being got at Swaithe are the Bishop of Llandaff, and J. M. Gaskell, Esq., of Thornes House, Wakefield, the quantity raised at the two collieries when in full work being about 7800 tons a week, a good deal of which is sent to the London and other southern markets. The proprietors of the collieries are J. Mitchell, Esq., Swaithe Hall (managing partner); C. Bartholomew, Esq., Broxholmes, Doncaster; and John Tyas, Esq., the present respected mayor of Barnsley.

The great importance of having appliances by which coal brought to the bottom of a pit can be speedily raised to the surface cannot be over-rated, and as Mr. John Mitchell has paid considerable attention to the subject, a brief notice of his methods may not be out of place, especially as they formed the basis of a discussion at the recent meeting of the Institute of Mining Engineers. Of course the principle laid down is that double cages can be so constructed and arranged that they can be worked with the same ease as single ones. For that purpose two fold arrangements have to be made, in the first place to allow of the corves being run into the cage at the bottom of the shaft, and in the second to take them off again after they are drawn to the top of the pit bank. The means of effecting that object—the putting the corves on the cages at the bottom—would be to construct a platform at the same height as the top deck of the cage, and arrange the workings below so that one-half of the coal could be brought over and the other half under it, so that both tiers of corves could be run in simultaneously. Where such an arrangement could not readily be adopted, four additional or duplicate cages or platforms, for the purpose of raising the full corves and lowering down the empty ones from the upper deck of the principal cage, can be used. By that arrangement the loaded corves would have to run on the duplicate cage, and then be raised by means of four screws working through nuts attached to the four corners of the duplicate cage or platform, geared by bevel wheels at the lower end of the screws to shafting running across the pit bottom to similar screws geared in the same way to the duplicate cages on the opposite side of the shaft for lowering the empty corves after they have been run out of the principal cage. By arranging the four duplicate cages or platform so that one pair should be alternately raised or lowered to the upper deck of the principal cage, that the full corves could be run on and the empty ones taken off as readily as though they were on rigid platforms.

A small amount of power would be required for the screws, either steam, water, or atmospheric. Instead of screws, however, small hydraulic rams, steam or air cylinders, might be adopted, with a stroke the full length of the traverse of the duplicate cage. The arrangement at the pit bank for taking off the loaded corves from the principal cage, and replacing the empty ones, might be done on the same plan as described for the bottom; but instead of working the screws by means of separate power the extension of the length of shafting is recommended, so that it would be connected with the drum shaft of the winding-engine, and its direction would then be reversed by each drawing of coal, and the duplicate cages would thus be alternately raised and lowered to distance or required height. Another arrangement for banking coals at the pit top would be to make an upper landing or platform at the required height, to run corves on the upper deck of the principal cages, and then construct on each side of the pit-head framing two short inclines, down the centre of each short flat endless chains, with L-links, gauged at short distances apart, should be laid for the purpose of running the loaded corves down on the main landing, and so by the extra gravity draw the empty corves up the opposite incline on the raised platform or stage.

SOUTH MIDLAND INSTITUTE OF MINING, CIVIL, AND MECHANICAL ENGINEERS.

A monthly meeting of members was held on Monday, in the rooms of the Institute, the Exchange, Wolverhampton; Mr. H. Beckett, F.G.S., past president, in the chair. Mr. James Cope, F.G.S., hon. secretary, announced that the names of four gentlemen proposed as new members had been duly passed in the room, and that otherwise the rules relating to the nomination of new members had been observed in this case. The meeting then elected as new members Messrs. John Lloyd, Lilleshall, near Wellington; Thomas Perry, Rowley Hall, Dudley; Samuel Green, Bilston; and William Edgeworth Gibbons, Deepfields Furnaces. The Chairman expressed his satisfaction at the steady progress in numbers which this election manifested. Business connected with the internal management of the Institute was transacted, and its further consideration referred to the council.

Reference was made to the recent terrible accident at Moss Pits, near Wigan, and warm sympathy was expressed for the sufferers. It was suggested whether it would not be a wise course for the Institute in all such cases to send a representative to investigate the circumstances of such accidents, and on behalf of the Institute prepare a report for insertion in the Transactions of the Institute, and for subsequent distribution amongst the working colliers in particular. Mr. Bromley, who had introduced the subject, felt sure that if Messrs. Craig and Bidder's magnetic locks had been used on the miners' lamps the accident would not have happened. The members would remember the paper he had read on that excellent lock. Since that time colliery managers, who had not a previous knowledge of the invention, had remarked to him that it was just the thing that they greatly needed as a protection from explosions that originated in the reckless use of lamps by miners. The suggestion was well received, and it was understood that the council would consider its practicability, and report to the Institute at a future meeting.

The Hon. Secretary announced that arrangements had been made for papers to be read at the next meeting; at which time the past president said he should be prepared to read a report he had drawn up professionally upon the practicability of a tunnel under the British Channel. During the meeting much interest was taken by the members in examining some mineral specimens shown by Mr. Bromley, particularly a bright and very perfect Megalicthys (or fish's tooth), found in the deep mine ironstone bass in the north of Staffordshire, at a depth of 270 yards.

THE IRON AND STEEL INSTITUTE—THE EXCURSIONS.

Whilst one portion of the members of the Institute were accompanying the interesting excursion of the mining engineers, of which we gave full particulars in the Supplement to last week's Journal, the others visited the following works in Birmingham:—Gammon and Co., Great Brook-street, glass; Nettlefold and Chamberlain, Broad-street, screws; Payton and Son, Northampton-street, jewellery; Taylor and Co., George-street, pins; Watts and Manton, Regent-place, buttons; Baker and Co., Chester-street, Ashton-road, wire mills; R. Thomas, Icknield Port-road, edge tools; Tonks and Sons, Moseley-street, brass foundry; May and Mountain, Berkeley-street, engineers; Hardman and Co., Newhall-hill, church furniture works; Gillott and Sons, Graham-street, pens; T. and J. Bragg, Victoria-street, jewellery; Hadley Brothers, Eyre-street, cut nails; Small Arms Factory, Small Heath, small arms. We shall describe briefly some of the more important of these works, and, taking them in their order, we have first Messrs. Gammon and Co.'s Belmont Glass Works. Nearly 200 men and boys are engaged at these works, which are divided into two departments, one of which is set aside for the production of cut and pressed table ware, and the other for shades, globes, chimneys, and every description of glass for lamps and gas fittings. In the glass-house there are two furnaces, each holding about 12 crucibles, in which the white sand (obtained from the North of France), the saltpetre, and the red oxide of lead are placed and rendered into glass by the intense heat. Upon the glass arriving at the consistency of paste it is ready for use, and is withdrawn as required, either to be taken to the presses, or to be blown into any desirable shape. In this state it can be twisted or cut by scissors, and moulded into every conceivable form. All the glass is annealed, to prevent the brittleness arising from too rapid cooling. In separate shops the grinding and cutting is done, the former principally by girls, who place the article to be operated upon in a lathe, and whilst it is revolving press sand upon it, giving the whiteish appearance that is found upon the majority of gas globes. The cutting is done by men and boys, the rougher work upon iron discs, which are made to revolve, a stream of sand and water running upon them the whole time. The work is finished off upon stones and wood discs, which vary in diameter, according to the fineness of the work required.

The screw works of Messrs. Nettlefold and Chamberlain are very extensive, for besides those which were visited in Broad-street there are other large establishments at Smethwick and King's Norton. The Smethwick factory is one of the finest manufacturing premises in the Birmingham district, but it is kept strictly private, as it contains many special machines, which dispense with a large amount of hand labour. At Broad-street screws are made varying from ¼ oz. to 200 lbs. in weight, and from the smallest dimensions up to 2 ft. in length. The iron wire is first cut to the required lengths; the head is then formed, and the whole brightened. The nick is now cut in the head by a small machine, the screw is then pointed, and the thread put upon it. Messrs. Payton and Son are large manufacturers of ladies' jewellery, and a goodly number of workpeople are employed. The thin wire, of which so much is used, is drawn and twisted by machinery. Great care is taken, too, of the sweepings of the benches and shops, so that there shall be no waste of the valuable material from which the many exquisite ornaments are produced. The tools used by the workpeople are mostly made and repaired in a shop in the factory. Perhaps no place was of more interest to the visitors than the pin and wire works of Messrs. Taylor and Co. We notice, first, the department, where the wire is prepared from which the pins are made. Large coils of rough wire—rough when compared with the state to which they are brought before being used in the pin-making machines—are drawn through the rolls, and diminished to a certain gauge, when they become brittle, and require to be annealed. This is accomplished by placing the wire in large cast-iron cylindrical-shaped pots, which are subjected for some time to an intense heat. It is taken from the pots, and again goes through the process of rolling till it is reduced in some instances to almost the fineness of thread. Many tons of wire are prepared in this establishment for securing the corks in bottles containing effervescing drinks, and some idea may be gained of the quantities supplied, when it is stated that 1 cwt. of wire is sufficient for 43,000 bottles. The wire is taken from this part of the premises to the machine room, and the coils are placed upon the drums of the machines. The pin is completed in one machine, which straightens the wire, cuts it to the length, forms the heads of and points the pins, that fall out into a receptical, and only require to be boiled in tin to prepare them for use. From this one establishment the almost incredible number of 60 millions of pins is sent out every week. Hair-pins are also made with the same facility and rapidity.

The button factory of the Messrs. Watts and Manton is situated in Regent-street; it has been established 80 years, and employs nearly 500 hands, besides 100 more who do the work at their own homes. The old-fashioned clumsy-looking metal buttons worn 50 years back

were made in large numbers by this firm, but they are now engaged almost exclusively producing buttons with metal discs covered with some fabric. No steam power is used, and the buttons are made throughout in the hand-presses, of which there are 350. In one press the disc is cut out, it is passed to another and shaped, and so on to others, which cut and place the cloth, or whatever it may be, so that the button is completed ready to be placed upon the card and sent out to the trade. In one year 60 tons of metal are used at this factory for buttons, and the total number of buttons turned out is something like half-a-million gross per annum. The tools are made and repaired by special workmen in the employ of the firm. Messrs. William Tonks and Co., Moseley-street, have nearly 400 men and boys engaged at their brass works. The articles are first moulded and cast in the foundries, and, after being rough dressed, are placed in the "shaking barrels," where they are cleansed from the sand that adheres to them. In the dressing, finishing, and polishing shops the castings are soon transformed from dull, uninteresting objects into works of art that grace the habitations of the great. The tools and machines used in the establishment are made in the fitting-shops. Tubes are made here to a large extent, and machines are at work twisting and ornamenting them. Cox's patent smoothing machine is in operation polishing the tubes, which it does admirably, and in a very little time.

RECENT IMPROVEMENTS IN EXPLOSIVE COMPOUNDS.

By Perry F. Nursey, Memb. Soc. Eng.*

The importance of having in certain engineering operations an explosive compound possessing violently disruptive powers, combined with safety in use, is too well known to require insisting on here. Such a substance having become, in many cases, a real necessity, it is of consequence to the engineer to obtain information respecting the progress made by science in utilising and bringing into subjection the dangerous substances which nature and art have combined to place at our disposal. In a paper upon the subject of explosive compounds for engineering purposes, which the author read before the Society of Engineers in February, 1869, he reviewed the whole question down to that time, tracing out the progressive history and development of various explosives, and showing the applicability of some to engineering operations, and the inutility of others for any purpose whatever. It will, doubtless, be remembered that in that paper gunpowder, in its several varieties, was noticed, as was also Colonel Ryley's old proposition to render gunpowder non-explosive and explosive at will by enveloping the grains in a foreign substance, as well as Mr. Gale's revival of the same idea in recent times. The various nitrate and chlorate powders were then noticed, including the very powerful chlorate powder of Mr. Horsley, Hockstädter's gun-paper (re-patented by Reichen in 1866). Reveley's white gunpowder, Schultze's gun-sawdust, and Neumeyer's inexplosive gunpowder were then described, and various experiments made with them recorded. The author then referred to nitro-glycerine in its original and dangerous form, and in its new and safe condition, as modified by Nobel, and rendered comparatively harmless. Gun-cotton, and the various improvements introduced in its manufacture by Prof. Abel, were then noticed; and, finally, the then recently-discovered method of firing it with a percussion fuze in the open air, by which means all the resistless energy of the material became developed, was described.

The author has thought it well to give the foregoing brief resumé of his previous paper, as it leads up to the present one, in which he purposes to give an account of such practical progress as has been made in explosive compounds since he last addressed the society upon the subject. Since that paper was read the author has watched the progress made in the development of the question, and an examination of the result shows them to be as follow:—In the first place gunpowder has been improved in certain respects, to meet the requirements of the increased calibre of our heavy ordnance. In the second a new blasting material has, within the last few months, been brought before the public with a view to its introduction into England, by Prof. Engels, of Cologne. In the next place a new explosive powder, designed for use in shells, has been brought forward and tried by Prof. Abel, and the introduction of a new powder for explosive bullets has been attempted, but has not succeeded in England. Beyond this there have been three distinct modifications of dynamite advanced by Abel, Horsley, and Schultze respectively. The object of each has been to replace the silica in dynamite by substances which would equally well absorb the nitro-glycerine, and yet be explosive in themselves, thus giving a stronger powder as the resulting compound.

The improvements which have been made in gunpowder have reference mainly to the size and density of the grains. The necessity of an alteration of the manufacture in this respect was first recognised in America, where it was rendered apparent by the gradually increasing dimensions of their heavy artillery. The first practical exponent of the theory of large grain powder was Dr. Doremus, of the United States, who manufactured the powder in small cakes, which were pierced with numerous perforations. We next find Russia producing prismatic powder, which consists of meal powder compressed into flat perforated cakes, of hexagonal form, 1 inch thick, and 1¼ in. across the extreme points. These prisms are made by a machine somewhat similar to that of a table-engine, and by which they are turned out with great rapidity. Prussia is also using gunpowder of a similar description for her heavy ordnance. Prismatic powder, however, is inferior in effect to both pebble and pellet powder, and only answers in charges for guns up to about 8 in. calibre. In heavier guns it is found to break up and deteriorate. The other two forms of large grain gunpowder are known as pebble and pellet powder. Pellet powder is simply pressed cakes broken up into coarse fragments, varying in size from a horsebean to a nutmeg, and of irregular shape, and which are glazed and finished in the usual manner. The manufacture of pebble powder involves a special press, in which the meal powder is compressed into small blocks of regular form, and of varying dimensions.

In order to trace the history of the production of pebble and pellet powder in England it is necessary to revert to the labours of the Committee on Explosives, under the presidency of Colonel Younghusband. About two years since the committee specially addressed itself to determining the kind of gunpowder which, when employed in large charges, would have the least tendency to overstrain the gun. Amongst other points, it was ascertained that the rapidity with which elastic gases are produced by the firing of gunpowder is in proportion to the fineness of the grains. It was found that small grain powder exercised its explosive power most rapidly, whilst that of large grain powder was developed more slowly. The result of their investigations and experiments showed that in guns of 8-in. calibre a large reduction of pressure was attained by the use of either pebble or pellet powder in battering charges, without any further diminution of velocity. Further experiments were then made with 10-in. guns, which confirmed the previous results, and led the committee to conclude that this description of powder might be used in guns of the largest calibre. They believed it would produce an initial velocity equal to that obtained with the ordinary service powder, whilst at the same time the strain on the gun would be materially reduced. In consequence of these conclusions Mr. John Anderson, the superintendent of machinery at the Royal Arsenal, Woolwich, designed a machine for manufacturing pellet powder, which was erected at the Royal Powder-Mills, at Waltham.

The machine consists of a turn-table of about 6 ft. in diameter, toothed on its periphery, and revolved with the hand by a pinion. At right angles with each other, on four opposite points of the table, are four circular metal plates, about 2 in. thick and 18 in. diameter, each containing 200 chambers, formerly ¾ in., but now reduced to ⅝ in. diameter. The chambers are fitted with pistons worked by hydraulic pressure from beneath, and have also movable stop-covers. When the apparatus is in work two of the sets of chambers, those opposite each other, are undergoing a similar operation at the same time. With the stop-covers lifted, and the heads of the pistons about 1¼ in. below the upper surface of the moulding-plate, the chambers are filled with meal-powder, and the upper surface then swept clear. The stop-covers are then fastened down, and the pressure is applied to the pistons, by which the 1¼ in. of powder is compressed to ⅝ in. The covers are then lifted, and the pistons pressed upwards till their heads are flush with the upper surface of the plate, and the pellets lie loose, ready for removal. The machine then receives a quarter turn, and the pellets are swept off from these two sets of chambers, while the filling and pressing is being carried on in the other two sets. The pressure on the rams is about 1025 lbs. per square inch, or allowing for friction (say) 1000 lbs. The machine is worked by three men, and the pellets produced are clean made and hard. It does not, however, appear that the pellets made by this machine have been introduced into the service, nor has it been found necessary to erect a second of these machines at the Waltham Mills.

Realising the circumstance that the manufacture of pellet-powder would become a special and increasing branch of industry, in consequence of the increase in the calibre of heavy artillery both at home and abroad, Mr. Jabez James directed his attention to the production of a safe and simple press for making the pellets. He perfected his ideas in 1869, when he constructed a press on the hydaulic principle. This was at once adopted by Messrs. Curtis and Harvey, of the Hounslow Powder Mills. There are now five of these machines, which have been working with perfect success for more than two years past. The author examined these machines a short time since at the Hounslow Mills, and was informed by Mr. W. J. Brown, the manager at the works, that they gave every satisfaction. Each machine consists of a strong cast-iron framing and head fixed by bolts to the top of a hydraulic press. Within this framing are arranged horizontally the various gun-metal plates and punches for forming the pellets. The centre plate has a flange on either side, and is supported on a groove formed on the inside of the cast-iron framing, and is bored through with a number of circular holes ⅝ in. in diameter. The lower plate carries a set of long punches, which form the bottom of the pellets, and which also expel the pellets from the centre plate when formed. This lower plate is supported by the head of the hydraulic press. The upper plate carries a series of short punches, which form the top of the pellet, compressing the mealed powder to the thickness of ½ in. This plate is movable in a horizontal slide on the underside of the head of the framing. It is worked by a screw from a handle in front of the machine, and is thrown to the rear of the press when the holes in the centre plate are being charged with meal-powder, and also when the pellets are being expelled and removed. Stops are inserted between the centre and the lower plates, in order to allow of variations in the thickness of the pellets. There are also stops between the flange of the centre plate and the grooves in the framing, to hold the plate in position when the pellets are being expelled. The stops are all self-acting, and are governed by the upper plate; when this plate is moved back clear of the perforated plate beneath it the upper stops are thrown into gear with the centre plate, and the lower ones are withdrawn. The withdrawal of the lower stops having permitted the lower plate to ascend further, and its punches to clear the holes of the newly-formed pellets, which are rapidly swept from the plate and the holes re-charged, the upper plate is drawn into position again, when the upper stops are withdrawn, and the lower ones inserted. The dimensions of the pellets are ⅝ in. in diameter, and ½ in. thick. There are 250 perforations in the centre plate, and each press turns out one charge about every five minutes, or 3000 pellets in each hour, with two men working it. The quantity of meal-powder used at each charge is 3¼ lbs.; the pellets, consequently, run about 72 to the pound. Such is the success of these machines that the author is informed that there is a probability of an order for several more shortly being given.

Although both pebble and pellet powder promised so well in the early experiments of the Committee on Explosives, already referred to, and which were made with the 8-in. and 10-in. guns, it has not yet succeeded with guns of larger calibres. Of this fact the most recent addition to our heavy artillery—the 35-ton 700-pounder gun—affords a notable instance. The proof of this fine gun dispelled all the anticipations of the committee with regard to increased velocity and increased strain. Not only did the pebble powder inflict an excessive strain upon the great gun, but its use produced irregularities with regard to velocities which involved the powder question in greater perplexity than ever. Another annoying circumstance in connection with the use of pebble or pellet powder is the action of the gases on the bore of the gun under the influence of the great heat evolved in combustion. Although combustion proceeds more slowly with large than with small grained powder, the heat generated appears to be greater, and, singularly enough, the recoil is more severe. Although the size of the powder grains prevents them forcing their way along the slight space between the projectile and the bore of the gun, yet the burning gases readily insinuate themselves into the grooves of the rifling, and act deleteriously on the metal.

The 35-ton gun on its proof was first fired with 75 lbs. of pebble powder and a 700-lb. projectile, the powder charge being gradually increased to 130 lbs. The initial velocity, however, reached its maximum with 120-lb. charge, when it was 1370 ft. per second, with a pressure of 47 tons per square inch; with a higher charge the velocity fell off to 1348 ft. This would seem to indicate that 120 lbs. of powder is the utmost quantity that can be profitably consumed in the bore. But here we are met by considerations touching the length of the powder charge in the bore of the gun, and the method of igniting it. In the 35-ton gun, with a calibre of 11·6 in., 120 lbs. of powder occupies a considerable length of space in the bore, and 130 lbs. of course a still longer space. The vent is placed about 12 in. from the bottom of the bore, and the charge is ignited from the side. This method of igniting the large charges required for heavy guns is open to the objection that a portion of the slow burning powder is blown out unconsumed, or only partially burned, from the gun. That this is one of the reasons of the vagaries exhibited by the 35-ton gun at its proof the author has no doubt, inasmuch as he has picked up fragments of unconsumed pebble powder from the proof butts at Woolwich, not many yards from the muzzle of the 35-ton gun. A further confirmation of the fact that this will occur, even with guns of smaller calibre, and consequently firing smaller charges, is to be found in the circumstance of the author having picked up similar unconsumed grains of pebble powder, which were strewn about over the ground, between the guns and the targets on the practice ranges at Shoeburyness. The remedies which suggest themselves for these irregularities are to reduce the length of the charges as much as possible, and to ignite them from the centre instead of from the side or end, whilst a wad, or some such device, may be found useful in closing the grooves against the passage of the gases. The whole subject, however, is under the consideration of the Committee on Explosives, in whose hands the solution of the difficulty may be safely left.

It may, however, be interesting to know that satisfactory progress is being made towards a solution of the difficulty as regards reduced pressure and increased velocity. The most recent investigations at Woolwich show that with solid powder pellets, ¾-in. diameter and ¾-in. thick, the pressure was 47 tons to the square inch, and the velocity 1430 ft. per second. With pellets ¾ in. diameter, ½ in. thick, and having an indent on one face about 3-16ths in. diameter, and about ¼ in. deep, pressure of 23 or 24 tons per square inch were obtained. But the objection to this form of pellet is that it is difficult to glaze, on account of the indent. The next idea was to split the indented pellets into halves, which is done by a small machine at the Hounslow Mills, the halves being then glazed in the usual way. With these broken pellets the pressures—even in the 35-ton gun—have so far been found to be reduced to 14 tons to the inch, whilst the initial velocities remain at 1430 ft. per second. This forms a remarkable contrast to the 47 tons pressure and 1348 ft. velocity obtained with this gun on its proof.

Turning to the new explosive substances that have been brought before the public since the author's previous paper, we find them to be six in number, as already mentioned. The first of these is lithofracteur, which is a compound of German origin, having been invented by Prof. Engels, of Cologne, in which city it has been extensively manufactured for the last three years. It is known and used in the various mining districts throughout Germany, and was probably for the first time brought under the notice of the English public during the Franco-German war. In the course of that memorable struggle, whenever opportunity offered, the French administered to the Prussians sundry violent doses of dynamite. The Prussians responded by dissecting a few bridges and removing one or two villages by the application of lithofracteur. This substance is a stiff pasty composition, of dark-grey colour, its component parts being nitro-glycerine, gun-cotton, the constituents of gunpowder, infusorial earth, and one or two other substances. This substance, so far as experience has gone at present, is one of the most violent, and at the same time safe and useful, explosive compounds yet discovered. The compound is made up into cartridges by wrapping it in thin paper, the size being 4½ in. long by ⅞ths of an inch in diameter. It possesses the same peculiarities with regard to non-explosiveness under ordinary conditions of ignition in the open air as do dynamite and gun-cotton. Lighted by a common match in the air, lithofracteur simply burns out like so much damp gunpowder, leaving a light white ash. When, however, it is fired with a percussion fuze all its resistless energy is fully developed, and it explodes violently.

In May last a series of practical experiments were made with lithofracteur, in order to demonstrate its power, and, at the same time, its safety, with the view to its ultimate introduction into England for mining purposes, for which it is eminently adapted. The experiments were carried out at the limestone quarries of Mr. R. S. France, at Nantmawr, near Shrewsbury, and at the greenstone quarries, belonging to the same gentleman, and situated in the same direction, Mr. France, having used gun-cotton at his quarries, and accidents having occurred with it, was naturally desirous to obtain the aid of a powerful and yet safe explosive, such as lithofracteur appeared to be, in his workings. He accordingly placed his quarries at the disposal of Messrs. Gebruder Krebs and Co., who are the manufacturers of lithofracteur in Cologne, in order that it might be thoroughly tested in England. Accordingly a number of gentlemen connected with the scientific, mining, and shipping interests were invited by Messrs. Krebs to witness the trials, which were conducted by Professor Engels.

The author, having assisted at those experiments, is enabled to report upon them from his own observations, and from notes taken at the time. The first series of trials were carried out at Mr. France's Nantmawr quarries, which are situated in a carboniferous limestone range, about 22 miles from Shrewsbury. A railway runs to the foot of the quarries, and the workings are approached from the line by an incline 500 yards long, laid with a double line of rails. The limestone is brought down this incline by gravitation, the full wagons hauling up the empties by means of a wire-rope. At the summit of this incline 15 lines of tramway branch off to various points at the face of the workings, which presents a fine vertical wall, varying in height from 120 to 170 feet. The limestone is of a fine close texture up to within a short distance of the top, where it is close in grain. This upper portion is burnt for lime at the quarries, where there are 16 kilns for that purpose. The lower portion is used in ironworks as a flux, for which it is well adapted.

The preliminary experiments consisted of throwing a box, containing 5 lbs. of lithofracteur, from the top of the workings, at a height of about 150 ft., on to the plateau below. The box was smashed up, and the cartridges were scattered about, but no explosion or even ignition occurred. A cartridge was then ignited by a common cigar fuze, when it burnt slowly away. A cartridge was then placed upon a block of stone, and ignited by a detonating fuze, when it exploded with a sharp report, and split the two angles off the top of the stone, leaving it like the gable end of a house.

A number of large stones were then broken up for the purpose of ready loading on to the trucks, for conveyance from the face of the workings. In ordinary boys bore frit-holes a few inches into the stone, in which small charges of gunpowder are exploded, and the stone shattered. Charges of lithofracteur were now used, the holes being damped with water, and the results being in every case satisfactory. These experiments served to demonstrate the fact that lithofracteur is unaffected by water—a matter of very great importance where mines are situated in wet ground, as well as in subaqueous operations. Another important feature of the water-damping is, that if a miss-fire should occur—as, indeed, it did during these experiments—the charge of lithofracteur can be withdrawn, and a fresh fuze inserted, without the least risk of danger. In blasting with gunpowder or gun-cotton, should a miss-fire occur, the damping—which is usually sand or mining debris—has to be picked out piecemeal to re-fuze the charge, and it is in this dangerous operation that so many accidents occur. A series of shots were then fired on the face of the quarry at various points, with bore-holes prepared in the same way as for gunpowder blasts, with the exception that the vertical holes were bored much further back from the face of the work than they would have been in ordinary. The first blast was a nearly horizontal hole, 3 feet 4 inches deep and 1¼ inch in diameter. Charged with about 1 lb. 1 oz. of lithofracteur, and tamped with water—water-tamping being used throughout the experiments. Large masses of rock were detached by the shot and thrown forward, the face of the rock being cracked and scaled over an area of 19 ft. wide by 12 ft. high. The value of these results will be evident when it is mentioned that gunpowder would have made no impression at all in these horizontal bore-holes, and in fact, would not have been used. A number of other shots, horizontal, angular, and vertical, were fired with equally successful results; one of these, however, deserves special notice. This was a hole 4 ft. 6 in. deep, bored vertically into the limestone on one of the terraces formed in the course of working, and at a height of about 20 feet up the face of the quarry: 17½ ozs. of lithofracteur formed the charge, which brought down about 20 tons of stone, besides loosening a large portion of the surrounding rock. This result was incalculably greater than would have been produced by a very much greater quantity of gunpowder.

The disruptive power of lithofracteur, when fired in the open air with a percussion-fuze, was then demonstrated by breaking a piece of rail in two. A piece of double-headed rail, weighing 75 lbs. to the yard, and measuring 4 ft. 6 in. long, was supported at each end on blocks 2½ in. high. It was laid on its side, and 1 lb. 3 ozs. of the compound was placed in the channel between the two heads. The tamping consisted of a few pieces of paper, the wrappers of the cartridges, and three tramway timber sleepers. The explosion smashed the sleepers into fragments, and sent them flying through the air, blew 11 inches in length out of the web of the rail, and cut one head through. The rail was much bent, and the other head would have been cut through but that its nearness to the ground gave it insufficient depth. The experiment was, therefore, repeated with two similar pieces of rail, placed on supports 18 inches clear of the ground. The charge was 1 lb. 5 ozs. of lithofracteur, placed as before, and tamped with paper, and five old sleepers. The explosion made matchwood of the sleepers, hurling the fragments in all directions, and breaking both rails clean through. The halves of the rails were thrown some distance apart, and a hollow basin was blown out in the ground under the line of the explosion.

So far the question of power only had been tested, but with the most satisfactory results. It was, however, necessary to demonstrate the safety of the compound, in order to remove the ground of objection urged by railway companies and others against the the transit of explosive materials. Mr. France, therefore, suggested that an admirable opportunity offered for testing the effects of concussion by allowing a railway wagon to run at full speed down the incline already referred to, and which should be met by another wagon placed at the bottom of the incline, where the bare concussion of the wagons alone would shiver them into fragments. An old mineral wagon was, therefore, fixed near the bottom of the incline, and a second wagon was taken to the summit. To the upper wagon were attached two cartridges, which were so fastened to the ends of the wooden buffers that they should receive the first blow in the collision. Upon the upper wagon, weighing 1½ ton, being freed it rushed with tremendous velocity down the incline of one in eight for its length of 500 yards. The wagons upon coming into collision were, of course, smashed to atoms, as was foreseen, but no report whatever was heard, and upon examining the wreck the contents of the cartridges were found smeared about the buffers and other parts of the wagons.

Upon the suggestion of Mr. Brown, of Woolwich Arsenal, who attended the experiments on behalf of the Government, that an explosion might take place between iron and iron, or even between wood and iron, Mr. France directed two more wagons to be placed on the rails as before, the upper one having the buffers plated with iron. At the author's suggestion two cartridges were also tied on the rails similarly to fog signals, and over which the wheels of the wagon would pass at an enormous speed on its way down. This would de-

* Read at the meeting of the Society of Engineers on Oct. 2.

termine the question of safety on contact being made between iron and iron. The upper wagon, carrying the cartridges, was released, but on reaching a point half way between the top and the bottom of the incline the velocity with which the wagon was travelling caused it to leave the metals, and a wheel breaking rendered that wagon useless for the experiment, thus unintentionally illustrating another class of railway accident. The only effect upon the cartridges was that they were crushed out of shape by the fall, but no explosion occurred. Another wagon with iron-plated buffers was then substituted for the last at the top of the incline, and run down. On passing the cartridges on the rails two semi-explosions occurred, the reports of which were not louder than would be made by a percussion cap being struck with a hammer. The great bulk of each cartridge was simply spread over the surface of the rail. On a subsequent examination of the spot it was found that only a portion of the cartridge had ignited, that being a minute fraction, which was exposed to the exact point of impact. The ignition, however, did not extend to the surrounding portion of the cartridge. A similar report to the last was heard when the wagons came into collision, and, on an examination of the wreck being made, the buffer-plates were found some yards off, with the lithofracteur still adhering to them. The contents of the cartridges on the rails were found spattered about in all directions, some having been carried along by the wheels, and deposited on the rails. Nothing could be more satisfactory than the results of these experiments, which it will be conceded demonstrated most conclusively the safety of the lithofracteur under the most trying conditions in which it was possible to place it.

The experiments at the Breidden greenstone quarries were similar in their general character to those at the Nantmawr limestone quarries, and gave equally satisfactory results. The rock here is of a very hard and dense character, and is largely used for road-making, for which purpose it is well adapted. It was from this quarry that Telford obtained stone for the Holyhead-road when carrying out that work. The stone being much more difficult to work than the limestone tested the power of the lithofracteur to the utmost. It appeared, however, as though the tougher the material to be displaced the greater the energy of the compound was developed. The final experiment was designed to show the applicability of lithofracteur to sub-aqueous operations, and its fitness as a charge for sea torpedoes. For this purpose a charge of 3 lbs. of the compound was secured under a timber raft about 6 ft. square, and which was floated out into the River Severn. It was then gradually loaded with stones until it sank in 6 ft. of water. The fuzes were then lighted, and the party retired to a safe distance to await the explosion. This occurred in a few minutes, and threw up a fine column of water, mixed with debris, some 60 ft. into the air. Several of the larger stones with which the raft was weighted were thrown up to twice the height of the column of water, and a few were afterwards found on the adjacent banks of the river. The waters were greatly disturbed, presenting for some distance a mass of seething foam, interspersed with fragments of timber, alternating with dead fish. The whole of the experiments were so thoroughly conclusive as to leave no room for question, but rather to give ample reason for expecting that lithofracteur will one day be allowed to find its way into the English market for blasting and similar purposes, for which it is so eminently adapted. The author is personally acquainted with a number of quarry proprietors and others who are anxiously awaiting the time when this or some other equally advantageous compound can be procured to aid in the further development of some of the most important mineral industries in the kingdom, and even in the world, but which are now more or less in abeyance for the want of a sufficiently powerful and safe blasting agent.

The author may here mention that he has been informed that a company has recently obtained a licence from the Secretary of State for the manufacture, storage, sale, transport, and use of dynamite, and other relative explosives, and that they are about to erect works near Glasgow for its manufacture. The author is not aware of the terms of the licence, but from the uncommon broadness of the pursuit he should imagine the safety clauses to be as uncommonly narrow and restrictive.

The next original explosive to be noticed is the picric shell-powder of Professor Abel. This powder is obtained from picric acid, and is mixed with saltpetre, forming a bright yellow powder, which exhibits no tendency to ignition from friction. Its detonating powers require a violent blow for their development, and the powder must be closely confined. It appears, therefore, very applicable to the purpose of charging shells, its explosive power being greater than that of gunpowder, but less than that of either gun cotton or dynamite. Some trials were made with picric powder at Shoeburyness in July last, at which the author was present. They consisted in firing shells charged with the powder from a 9-inch gun against an iron-plated target. The results were not such as to immediately establish the value of the powder, although they were sufficiently satisfactory to justify a further course of experiments with this substance, which appears to possess all the requirements of a shell-powder.

About a year since, some experiments were made in England with Pertuiset powder, a substance imported from France, and used for charging explosive bullets. Several horses were slaughtered by means of these bullets, and their skulls, ribs, and leg bones were beautifully shattered and mangled by their assistance. The secret of this powder was offered for sale to the Government, who very properly declined to recognise such a barbarous invention. The author understands, however, that several other European Governments have made terms with the inventor.

We now come to the class of improvements which have for their object the utilisation of nitro-glycerine. It will be remembered that Nobel first utilised it by mixing with it about 25 per cent. of siliceous earth. Engels, in his lithofracteur, substitutes for the silica substances which are of themselves violently explosive, and which, therefore, tend to increase the power of the compound by so much silica as they displace. This appears to be the object of the three inventions of this class about to be described. The first of these is Professor Abel's glyoxiline, which consists of granulated gun-cotton mixed with saltpetre and nitro-glycerine. Some effective blasting and engineering operations were carried out with this compound upon its first introduction.

The second of these applications of nitro-glycerine is due to Mr. Horsley, whose blasting powder was described in the author's previous paper. The powder is a mixture of chlorate of potash and gall-nuts, and Mr. Horsley has found that by mixing it with 25 per cent. of nitro-glycerine he obtains a most violent explosive. It is fired in the same way as lithofracteur and dynamite—with a percussion fuze. It possesses the advantage over dynamite of not losing its susceptibility to detonation at low temperatures. When confined, it can be fired without the use of a cap, by means of concentrated sulphuric acid. It is being used with considerable success in some mines in Norway, and has been tried with very good results in some Welsh quarries. Mr. Horsley has also devised a method of protecting nitro-glycerine by mixing with it finely powdered alum. When the oil is required for use the alum is dissolved out by water. This is a safe method of storing the nitro-glycerine for use in manufacturing the various compounds into which it enters.

It now only remains to notice the method adopted by Capt. Schultze for utilising nitro-glycerine. Capt. Schultze is the inventor of wood powder, which is sawdust treated with acids, and afterwards with nitrates. This powder he mixes with 17 per cent. of nitro-glycerine, which gives a powerful explosive, although one possessing less energy than dynamite.

From what has already been stated, it will be abundantly clear that there are two explosive compounds in particular of the nitro-glycerine class, which combine safety with power, and which it would be very desirable to have introduced into this country. These are dynamite and lithofracteur, both of which the author has singled out from the rest of the nitro-glycerine preparations because they have been tested well and fully on the Continent by long usage. But the reason why these substances are not in general use in this country, as they undoubtedly ought to be, is mainly owing to the prohibitory clauses of the Nitro-Glycerine Act. This Act served an essential purpose at the time it was framed, inasmuch as it gave security to the subject against accidents from the transport and storage of that most dangerous oil. But the Act went too far, in that it included all substances into the composition of which nitro-glycerine entered, It is true that there was the opportunity afforded of obtaining a licence from the Government, but so difficult was the process of procuring it, and so peculiarly stringent were its terms, that it was all but prohibitory to the manufacture of any compounds containing nitro-glycerine or its agent. But, as has previously been stated, the question of relaxing this law is now under consideration of the Government, and inasmuch as the Nitro-Glycerine Act provides for the introduction of substances containing that oil, if their substances can be proved, it is not too much to hope that the point will be gained. Of course, it will be said that we have gun-cotton to fall back upon for use in our mines and quarries. This is true, but it is also true that accidents with gun-cotton are by no means unknown in our mines and quarries, and these have shaken faith in its merits, which faith has been by no means strengthened by the recent catastrophe at Stowmarket. It, therefore, follows that the public must have some other material in which they can place a well-grounded confidence. In the present position of the question the choice lies between dynamite and lithofracteur, both of these substances having been proved to be practically safe as regards use, storage, and transit. With respect to the latter condition—that of safety in transit—it is to be observed that, as far as the author's experience goes, the crucial tests to which lithofracteur was submitted on Mr. France's incline, are absolutely in favour of that substance. It is, of course, open for dynamite to be submitted to a similar series of tests for safety under collision, but the author much questions whether dynamite would stand such tests as lithofracteur underwent. At any rate, the dynamite which he examined some three years since he is pretty sure, from the looseness of its composition and want of cohesion in the particles, would not. But even assuming that it did, there are yet other points which have to be considered in determining which is the better material. This is what the engineer really requires to know, and this is what a paper professiong to guide him in his choice should point out.

Let us first compare the two substances, dynamite and lithofracteur, as regards their composition and action. Dynamite consists of 75 per cent. of nitro-glycerine and 25 per cent. of an incombustible material. Hence it is clear that not more than 75 per cent. of any given quantity of the compound can be converted into power by ignition. On the other hand, lithofracteur contains about 75 per cent. of nitro-glycerine, and about 20 per cent. of combustible and explosive absorbent media, there being some 5 per cent. only of incombustible matter in its composition. It follows then, as a natural consequence, that lithofracteur gives out about 20 per cent. more power under conditions of work than does dynamite. So far their relative powers, as determined by their compositions. We will now look into their methods of manufacture. The base of each is nitro-glycerine, one of the most—if not the most—dangerous and treacherous substances that has been applied to practical purposes. Nobel manufactures his dynamite with nitro-glycerine prepared according to the ordinary formula, which includes no guarantee of safety. This fact is established by the explosion of nitro-glycerine which Mr. Nobel informed the author had taken place in his factory at Stockholm in 1868, and to which he referred in his previous paper, when illustrating the non-explosiveness of dynamite by concussion from adjacent explosions. Hence there is an ever-present element of danger in the manufacture of dynamite. Herr Engels, however, in making nitro-glycerine for the manufacture of lithofracteur, prepares it according to a special formula devised by and known only to himself, whereby he obtains perfect immunity from accident with that dangerous compound. The absence of accidents at the lithofracteur factory of Messrs. Krebs and Co., in Cologne, may not be a positive proof of this position, but it may be taken as negative evidence of the safety of the process of manufacture as carried on there. Hence we conclude lithofracteur to possess a greater explosive power than dynamite, weight for weight, and to be attended with less danger in its manufacture. And here, perhaps, the author may be allowed to compliment Prof. Engels upon the singular uniqueness of his discoveries, which reflect credit upon his name, and proclaim a mental capacity of no ordinary stamp, even in Germany, where the average of intellectual power reaches so high a standard.

It may be expected that before concluding the author should offer some observations upon the late lamentable explosion of gun-cotton. To treat the subject properly would require an investigation, which the author has not been able to make, and would, moreover, afford matter for a separate paper of itself. Any opinion, therefore, which he may express must be understood as being based upon a general knowledge of the nature and manufacture of gun-cotton, and upon a perusal of the evidence taken at the inquest at Stowmarket. Referring to previous explosions, as well as to the last one, it is notorious that they have all happened on extremely hot days, generally the hottest day of a hot season. It has hitherto been considered as barely within the limits of possibility that sound, pure gun-cotton would explode at a temperature such as could be raised by solar heat in a store, although some of the witnesses at first referred the explosion to that cause. On the other hand, nothing is easier than for impure gun-cotton to decompose and ultimately to explode spontaneously. This is, in fact, the inevitable end of impure cotton, if left to itself. At first sight, then, it might seem that there was some impure gun-cotton in the magazines at Stowmarket. But how could it possibly get there under the strict and careful supervision which appears to have been observed in Messrs. Prentice's works? The washers, the poachers, the driers, the tests, all were carefully tended, and no one seems to think that acid could get where it ought not in the manufacture, unless done wilfully; and, as there appears to have been no motive for such an act, this hypothesis must fall to the ground. As for the foreign emissary—well, the least said about such a piece of bogyism the better.

But assuming that acid did get into the cotton so vastly in excess as it was found to be in the Upnor samples, and that discs of this impure cotton did get into the magazines, why were not other impure discs found on the works? If the author rightly remembers the evidence, no unsound discs were found on the works, only sound ones, and these, too, were blown from the magazine by the explosion. Again, if the store at Upnor was part of the batch at Stowmarket, why was there not an explosion at the former as well as at the latter place, and at Upnor before Stowmarket, as the cotton had had longer time to decompose? Further, why should the cases at Upnor be found to contain a disc here and there to which sulphuric acid had been added in great excess to what was ever put into the cotton in course of manufacture? How could the acid have been put in at the works with cotton in course of being packed without detection? To the author's mind investigation has not been pushed sufficiently far to clear up these and one or two other points, which he cannot deem otherwise than mysterious. Two things, however, are patent. The first is that a misplaced confidence in the non-explosibility of gun-cotton, when ignited by ordinary means, cost Mr. Edward Prentice and his nephew their lives, and the sad circumstance disposed of a hitherto comfortable theory, founded on experiments which gave it the semblance of fact. The second is that acid was found to have been deliberately placed in the cotton at Upnor, but what possible motive there could have been to place it at the works, or whether it was placed in at the works, the reported evidence does not show. The author holds that there remains behind a mystery, the solution of which he does not find in either careless or revengeful workmen, or even in foreign emissaries.

It has been admitted by the advocates and supporters of gun-cotton, as well as by the Government officers interested in promoting the safety of explosive compounds, and in protecting the public, that there is a necessity for further investigation into the nature and properties of that material. This clearly implies that gun-cotton is not to be relied on for inexplosiveness under circumstances of ordinary ignition. It occurs to the author that the direction in which investigation should be pushed is that which relates to the protection of gun-cotton from itself. Of course Prof. Abel's processes of pulping and compressing have done this to what now appears to be a certain extent, not altogether. There is a strong analogy between nitro-glycerine and gun-cotton, the base of each being a vegetable production. In the former we have glycerine—a large proportion of which is prepared from palm oils—combined with nitric and sulphuric acids; in the latter we have cotton in a similar combination. Now nitro-glycerine—the result of the first combination—has been converted from an extraordinarily dangerous to a remarkably safe agent by admixture with foreign substances. Gun-cotton—the result of the second combination—has been made much more safe and reliable than it was by mechanical manipulation. It is for practical chemists to push investigation further, or rather to recommence it, by considering the analogous nature of the two bases, and by this light endeavouring to ascertain whether something more than mechanical treatment is not still necessary to render the stability of gun-cotton more perfect than it is at present. If, however, the explosion at Stowmarket was caused through some mysterious or occult agency, then the sooner facilities are afforded for the introduction of an explosive compound which carries with it no fear of any such results the better will it be for the interests of humanity, of science, and of enterprise.

THE AMERICAN PATENT SYSTEM.

In an interesting address delivered at the quarterly meeting of London Patent Solicitors, on Wednesday, Mr. GEORGE HASELTINE, M.A., LL.B. (the Chairman) observed that American legislation on patents for inventions is based on the first article of the Constitution. The eighth section declares that Congress shall have power to promote the progress of science and the useful arts by securing authors and inventors the exclusive right to their respective writings and discoveries. The Colonial and State authorities had exercised to a limited extent the prerogative of awarding inventors exclusive privileges, but the Confederation which preceded the National Union was not empowered to grant protection to the productions of inventive or literary genius. The Constitution has not prohibited the States granting patents, but it was the evident intention of its framers to confine this class of legislation to Congress—an intention respected by local legislators, who have enacted no *general* patent laws, and inventors have been so well content with the liberal character and efficient administration of the national system that they have rarely sought other protection or additional rewards. The Legislature of the Empire State, in 1798, passed a *special* Act, granting Robert R. Livingston the exclusive right of constructing and navigating every species of boats propelled by the force of fire or steam within its jurisdiction for the term of 20 years, provided he should, before the expiration of twelve months, construct a boat of 20 tons capacity, with a mean speed upon the Hudson River of four miles an hour. The patentee forfeited the grant, which was renewed to him and his associate, Robert Fulton, in 1803, and again five years later, for terms of 20 years. This grant possesses a scientific and historical as well as legal interest. It affords an eloquent illustration of the infancy and progress of steam navigation, with which Fulton was so intimately identified—a progress that has attained a mean speed of 20 miles an hour upon the Hudson, and transformed a boat of 20 tons into a steamship of more thousands. This fire-steam navigation proved a commercial success, which excited the envy of losing competitors, whose infringement necessitated a Chancery suit (not an uncommon result in later times), that at once impoverished the plaintiffs and established the concurrent but subordinate jurisdiction of the States in patent legislation. The Court of Errors, of which Chancellor Kent, the American Blackstone, was then a justice, decided unanimously in favour of the local grant. The judges adopted, without reserve, the doctrine of State Sovereignty, which now finds little favour with American legislators, though the amended Constitution expressly declares that the powers not delegated to the nation are reserved to the States or to the people.

The first Congress, recognising the justice and realising the policy of an efficient patent system, passed an Act to promote the progress of the useful arts, which was superseded three years later by a similar statute, and a repealing Act was passed in 1836, which in turn was superseded by the general statute of 1870. Several minor Acts intervened, and notably the one increasing the original term of a patent to 17 years, and equalising the fees to native and foreign inventors. Through all these changes the law-makers have never questioned the equitable rights of invention, or the wisdom of satisfying these rights by exclusive privileges for a term of years. The colonies and States, imitating the practice of the mother country, had more often granted patent privileges to importers than to inventors—a pernicious practice, that has found no recognition in the national legislation. Though the common law, that regards alike the importer and inventor, was the prevailing law of the States—a fact well known to the authors of the Constitution—and, subordinate to the statutes, was formally adopted by Congress, the American courts have never held that first importers are true inventors. The right to grant patents of importation is still vested in the States as the source of political power. The liberal legislation of Congress, which, recognising the universal brotherhood of genius, offers princely rewards to inventors without distinction, and virtually without price, has made America the home of inventions—the paradise of patentees: 60,000 original patents have been granted in 60 months, and half as many applications rejected, on strict investigation of novelty; still the rate of issue continues, infusing new life into every branch of industry. The money value of these patents is counted by millions; their industrial value exceeds the national indebtedness. Modern inventions constitute a vast wealth of the Union, whose marvellous progress is less attributable to the richness of its mountains or the fertility of its plains, than to the restless genius of the people. The demand for new inventions is insatiable, enterprises are impatient, and the State that incited the ingenuity of a Fulton to design a 20-ton steam-boat for the Hudson River has recently offered a prize of 20,000*l.* to the pioneers of steam navigation on the Erie Canal. Inventors are honoured as public benefactors, and the nation has erected to its 100,000 patentees—the leaders of its grand army of industrial progress—a marble temple of art, the noblest structure ever dedicated to genius of invention.

EXPLOSIONS OF GAS IN COAL MINES—No. III.

SIR,—With respect to blowers of gas which burst suddenly off, and frequently upset all the calculations of the mining engineer, they are the most alarming and most mysterious occurrences connected with coal mining. As to the chances of prognosticating their occurrence, we could not assert that this can be done at all generally, but it certainly can be done sometimes. In cases where the discharge of gas from the coal is not great generally, and in driving an exploring drift it suddenly becomes excessive, blowers of lesser or greater importance may be looked for. And of course safety-lamps will be used, not only near the point where the sudden discharge may be expected, but also at all points where the air current is afterwards conducted, and care will be taken that the current is not allowed to approach a furnace until it is properly diluted.

Those blowers sometimes burst out from the thill (bottom), and sometimes from the roof; but so far as we have observed, they generally come from the bottom. They are generally supposed to be the outlet from a "bag," or pent-up reservoir of gas, but they are frequently something more than this, as they often continue to give out gas for many years, which appears to point to the probable connection with fissures or faults of great extent.

In many cases the outburst commences with a discharge of water, and as the water discharged gradually decreases, the gas is given out. One very remarkable case we remember where this occurred, as shown by the following extract from notes made at the time:—

"1835—A great outburst of water took place in the south-east drifts, rather more than one mile from the shaft, this day, at 3 o'clock P.M. Examined the place at 7·30. Found the water gradually subsiding, and gas coming off very strong, precisely similar to the steam from the safety-valve of a boiler."

Since that time we have seen many sudden discharges of gas, but none equal to this in violence; it occurred in a new field, the seam being highly bituminous, and giving gas off freely at all times. The discharge from the blower rendered explosive the air-current at that point, the quantity of air in that split being 8000 cubic feet per minute; it also rendered the return air-current explosive after this particular current was joined by two other currents, making 24,000 cubic feet per minute; and without doubt it would have fouled the air up to the ventilating furnace, had the precaution not been taken to allow a "strong scale" of air to pass into the main return, 400 yards from the furnace. This blower continued to give off gas many years, but, of course, the quantity given off was greatly reduced.

One of your correspondents proposes to improve the ventilation of

mines, or the drainage of the gases therefrom (I am not certain that he contemplates the latter), by means of bore-holes put down by the use of steam machinery. This proposal appears to be well worthy serious attention, although, of course, many objections will be made to it. It is well known that the tendency has been of late to create large establishments, and have few shafts. Now, a hole bored (say) 2 ft. in diameter into the coal seam worked would be rather an awkward thing in some positions. Supposing such a hole was put down in the centre, or within the boundaries of a large goaf; this hole would be another downcast shaft, and the air descending it with great force, would possibly carry the gas into the working places from such goaf, and also from the strata through which such hole passed, should any gas be generated therein. Your correspondent appears to have assumed that those holes or small shafts would become upcasts, and would, therefore, carry the gases directly upwards; but this is by no means certain.

I would just venture to suggest that if those holes were carried down a certain distance without actually passing into the coal seam, they might possibly do good service, by carrying off the gases generated above the working seam. Now that holes can be bored by means of steam machinery quickly, and also of considerable size, and at a comparatively moderate cost, it really would seem that this ingenious suggestion should be made use of in some way. If we suppose that a few of those holes were put down in the main roads (intake currents), at a considerable distance from the shafts, a large quantity of fresh air would be most valuable there, and as this would shorten the length of the run of the air-currents, a considerable increase in the quantity of air circulated would be the immediate result. I propose to return to the subject again, but hope that some of your numerous correspondents will give their views of these proposed bore-holes.—*Newcastle, Oct.* 3. M. E.

THE EXPLOSION AT MOSS PITS COLLIERY, WIGAN.

Sir,—Being a constant reader of the Journal, I am to some extent aware of your predilection. Need I say that few of us coal miners can give their thoughts, whether of experience or of sympathy, in writing to the public on such an occasion as this at the Moss Pits Colliery, Wigan, or you would know that the Rev. Mr. Haines (to whom reference was made in last week's Journal) but utters the thoughts of many others. I firmly believe with him that explosions, as a rule, cannot nor ought they be called accidents. I should like to know if it was a fact that a number of the men were serving their notices in the pit on account of the gas at the time the underlooker made the remark that he could have taken a lighted torch through the works just prior to the explosion? What can be the motive in making such repeated allusions to excellent management at the places of such occurrences, pointing to the efficient machinery, the good arrangements of the shafts and surface for work, the quantity of air going through the works, the ability of the officials, and no limit to expense? These may be on the surface, but the danger of an explosion is mostly at the bottom, in the workings. If air be not properly applied, if men use defective lamps that they can unlock at will, and have the free use indiscriminately of blasting-powder and material, as night succeeds day so will there be explosions if there is gas.

You allude to Mr. Higson's report for 1869. I admire both his and the other Inspectors' reports—they are full of useful hints and good practical sense. I would on many occasions that they had power to do more than report, or that men of similar sense and effort held the position of managers of collieries. Each of the Inspectors know that all managers and officials are not the most sensible of men, and that there are some educated practical steady colliers whom 4*s.* per day will not tempt to take office, as they know its responsibility. I do not think it very good grace to be continually repeating "the loss of the proprietors" just at this time; they will know more about it by the time the pits are at work again—indeed, they are likely to do so for life. It was a great pity the explosion happened, but it was a mistake to close the pit at the time and at the place they did. It was a mistake to uncover them. Had there never been an explosion before there might have been an excuse, as an experiment; now we deem it a crude lot of blunders. The widows and orphans ought to be assisted with thousands, not with hundreds. The Rev. P. Haines evidently feels that to be a widow or an orphan has a meaning. The mine it is now said is flooded. Who will say the fire is extinguished?—*Bolton, Oct.* 3. —— A Miner.

THE WIGAN COLLIERY EXPLOSION.

Sir,—This disastrous explosion has again made the minds of those engaged in mining matters alive to the fact that every possible effort should be made to prevent the recurrence of such an event. We are told that the majority of safety-lamps in common use are anything but a security against explosions, and it is intended that an indicator which would detect the gas, and acquaint those in danger with its presence, would be perhaps the best safeguard against the havoc made upon human life by that deadly enemy—fire-damp. Now, it is not generally known that a gas alarm lamp, patented by Messrs. J. Hyde and Co., of Dudley, will accomplish this. The lamp is a very simple one, is supplied at a very moderate cost, and is, without doubt, the most effective indicator extant, as it extinguishes its own light, and rings a powerful alarm bell upon the accumulation of a sufficient quantity of gas to become dangerous. By this means ample notice is given to all those in the vicinity of the lamp to put out their lights and escape. Should it be hung in a part of the pit only occasionally frequented, anyone on approaching and finding the light out would necessarily be cautious. Alexander Smith.

Dudley, Oct. 3.

COAL-CUTTING MACHINERY.

Sir,—It is not my intention to give any reply to the letter of Mr. Wm. Leatham, which appeared in the Supplement to the Journal of Sept. 16, as his letter has been already fully answered. I may just say, however, in reference to it that he appears to forget that my paper was written not on coal-cutting in general, but on W. and S. Firth's improvements in coal-cutting; and also that I deeply commiserate with his failure to get himself appreciated as highly by others as he appreciates himself.

In reference to Mr. Rothery's letter of Sept. 23, I must say that I was astonished, as he has had the opportunity of reading my paper at full length, at the adroit way in which he proceeds to misrepresent what I there stated. What I said was this—"It is not my intention in this paper to describe the machine fully, as this has on many former occasions been done, but *briefly* to notice *some* of the recent improvements which have been applied." It is, therefore, ungenerous of Mr. Rothery to imply that the improvements I specified were *all* that had been made in the last nine years. Were the present machine fully described almost the only point of similarity which could be discovered would be the reciprocating action of the pick.

Again, Mr. Rothery cleverly leaves out the conclusion of a sentence in quoting my paper, with the object of conveying a false impression to your readers. As it appears in my paper it is as follows—"The original machine introduced at the West Ardsley Collieries was undoubtedly a good machine, and I should be very sorry to say anything against those who were so far successful, *but I must say that the recent improvements have made the machine.*" This implies that there was a good foundation in the original machine, but that without the recent improvements it must necessarily have failed to become the success which it is clearly proved to be. By the original machine I did not mean the one in which a blow was given to a pick by coiling and releasing a spring, which was the invention of Mr. Ridley and Mr. Rothery, and presents a great similarity to a patent taken out in the last century by Mr. Menzies; but I referred to the compressed air machine patented by Donisthorpe, Firth, and Ridley, which, so far as it went, was a good machine, as proved by the experiments quoted by Mr. Rothery. If your readers will refer to experiment No. 2 in my table, they will see that working under the same circumstances as Mr. Rothery mentions, with the same hardness of holing, we average 35 yards per hour, 3 feet deep, or in five and a half hours 192 yards, which is just 112 yards more than in the experiment which he mentions, and is undoubtedly the result of the improvements. The other experiments which were made by me were in very much harder holing, and your readers will easily realise the reason of the smaller average in those cases.

In reference to the loose points, it is very evident that neither Mr. Leatham or Mr. Rothery have seen and examined those invented by Mr. Firth; if they had done so I am convinced they would never have troubled your readers to examine or compare their own with them. I took the trouble to produce at the reading of my paper the one invented by Mr. Rothery, in order to show the difference between them, similarity there is none. I can only say that the only feeling that any practical man can have in hearing Mr. Rothery's claim to having invented a practical loose point, or one that will supersede Mr. Firth's, is that of intense amusement.

In conclusion, I would say that Mr. Rothery has himself taken out several patents for improved coal-cutting machinery, and from the glowing accounts he has of them when in embryo, both in the Journal and elsewhere, the mining world has great expectations from his efforts, especially as he has so often instructed your readers that he is the only inventor who really understands what is required. I am truly sorry that he has not succeeded, and I am sure I should welcome his success as cordially as anyone. Mr. Rothery states he invented the "curved" pick nine years ago, if that be so I deeply sympathise with him that he did not secure a patent for such a manifest improvement, for he must be aware that as he has only just made this invention public Mr. S. Firth's patent for it is still a valid one. If instead of entering on a discussion as to who invented the various improvements, where the matter cannot be decided, Mr. Leatham and Mr. Rothery would place before your readers the results which have been obtained by any of their numerous inventions, with the circumstances under which they were worked, they would do much more to advance their own interests, if their machines are worth anything, and also the interest of mining generally. In my paper I clearly stated, and I here clearly repeat, that it matters not to me who is the inventor, and that if I saw to-morrow a machine which would under the same circumstances that I witnessed at West Ardsley do better work I should at once say so. I must, at the same time, say that no machine I have either seen or heard of at the present time has done anything like the work, considering the circumstances, so cheaply and economically as the one under notice; and also that, having carefully studied the matter, I have not the slightest doubt of the validity of all the patents in connection with this machine. W. Hoole Chambers.

Thorncliffe Ironworks, Belmont.

DRILLING GRANITE.

Sir,—Some time back I read the account of a wonderful discovery of the power of a rotary stream of sand, whirled at immense speed, striking in a ring, or cup-like form, against the face of rock to be drilled. The account of its power of rapidly perforating the hardest granite, and of the ease with which the force could be guided, was perfectly marvellous.

Will some of your able correspondents favour us with a *resume* of the latest news, and present condition of this invention? If the narration of what has been done has any claim to accuracy or truth such a communication would be full of interest.

London, Oct. 4. —— A Man of Experience.

GOLD AMALGAMATION.

Sir,—In connection with a new quicksilver company at present being introduced in the London market a remarkable statement is made in last week's *Mining Journal*, affecting the Eberhardt and Aurora Mines; it is, that at those mines "every ton of ore reduced absorbs 1 lb. of quicksilver." Now, if this means anything, it is that 1 lb. of quicksilver is lost for each ton of ore reduced, because if the quicksilver be simply used and recovered again, so that it can be employed with a fresh quantity of ore, the demand would not be affected thereby, for only the loss has to be made up by fresh purchases of quicksilver. It may be the case that 1 lb. of quicksilver is lost for every ton reduced, but if this be so it would certainly be worth the while of the Eberhardt and Aurora shareholders to enquire whether so heavy a loss is absolutely necessary. Even already the quantity reduced is about 100 tons a day, giving 30,000 tons for the 300 working days in the year. Taking the mercury at only 60 cents a pound, the loss would represent $18,000 per annum, or sufficient to pay (say) an additional dividend of 3*s.* 6*d.* per share per annum.

I am quite aware that a certain amount of loss is sometimes necessary in carrying on a process on a commercial scale, but if the Eberhardt and Aurora Company are going to permit $18,000 worth of mercury to escape from their mill annually, and if the other mills in the district contribute an equal amount of wealth to the wastes, it might be worth the while of an independent company to undertake the recovery of the wasted quicksilver as a commercial enterprise, and I do not doubt that the profits would, taking the average of seven years, be greater in the Mines Waste Company than in the gold mining companies, although they might not pay a 10 per cent. dividend in the first three months. For my own part I am always glad to see capital provided for the development of any promising enterprise, but I object to statements prejudicial to one company being made in order to give an over favourable colouring to another.

Oct. 3. —— Hamiltonian.

MINING IN SALT LAKE CITY, UTAH.

Sir,—As I have had time only to make notes on various matters of interest to your readers since my last letter, I will give you the result of close observation, especially touching proprieties now owned in London.

The Mineral Hill Mines—the first I visited after leaving the Pacific Railway—are both extensive and promising. They have been so fully described and are so well known that I need simply add that they are immense.

Eureka is the most active camp in Eastern Nevada. The works of the Eureka Consolidated (Buckeye and Champion) are in full blast. A dividend of 10,000*l.* was paid on the 20th ult., and the company carry over 35,000*l.* surplus. New developments in the mines guarantee still greater results.

The Richmond Company made an important strike in their ground, and show a large body of high grade ore, which is far beyond the expectations of the owners. I learn that the property has been accepted by Mr. English, on behalf of London capitalists, and that possession was given on the 1st instant. It is without doubt a fine property.

The Pinto Company are pushing work at both the mines and mill. The management here is perfect, and the mines improve each day. A large quantity of fine ore is in sight. The mill and furnace will have an abundant supply. I met two gentlemen from London at the mine, and, they having orders from the secretary admitting them, were making a careful examination of the ores. My opinion is this will prove one of the best investments which has been made in the State. There is every indication of far greater metallic wealth than has yet been discovered. Masses of ore are found at the intersections of veins, and the Maryland Hill is covered with croppings as yet unexplored, but which surely point to much substance below. Passing on to Hamilton, I found the ground of the Eberhardt Company, and Governor Blaisdel's mine adjoining, looking better than ever. This last, called the Ward Beecher Consolidated, is new ground, and is worked by the governor himself, on a safe and quiet plan. Two mills, which are also owned by him, are fully supplied from this 300 ft. of mining ground.

The Eberhardt Company have an immense property, and, if it is properly managed, its dividends will satisfy all who are interested. Let it be remembered that very much depends upon the employers, as at such a distance they must act promptly, and, in most cases, upon their own judgment.

There are some other properties here owned in London, and of them I shall speak hereafter—first I will see if capitalists really invest money without making investigation when the way is perfectly clear and means always within reach. The Great Western was this time pointed out to me. I did not visit it. The principal shareholder I am told is here—he can post his friends.

From Hamilton, with a party of Londoners, I visited Pioche, 160 miles south-easterly, and found the wonderful mines of the Meadow Valley Company and Reymond and Ely. Nearly all this district is owned in San Francisco. It is second in production to none in the State. On to Star district, and to Salt Lake, a slow, tedious ride of 350 miles. In the Star district are to be found some of the best prospects in all Utah, but as yet little work beyond that for holding the claims has been done. The ores so far exposed are not unlike those of the Ely or Pioche district, and are far richer in silver than the product of the mines nearer Salt Lake City. I did not visit the mines of the Utah Company, but shall do so when the results so confidently predicted by Capt. Nancarrow are being realised. This city, well known as the "Mormon City," is full of life and activity. Here a stranger can be entertained at the theatre or in satisfying his curiosity in regard to the life and habits of the Latter-Day Saints. From this place I go to the railroad mining district, Austin and Belmont, from whence I will write.

Salt Lake City, Sept. 4. —— Wide West.

MINING IN COLORADO.

Sir,—Since my last note appeared in your valuable Journal in respect to the mining operations in Colorado, I have had several letters from persons interested in mining in that country, and one gentleman, largely interested, has called on me personally, to ask my opinion as to some letters that have appeared in the *Times*, stating the mines of that country to be worthless, and a swindle to the public, and as I have not seen these letters, neither do I know the writer, I hope, for the welfare of persons engaged therein, and the promotion of honest and legitimate mining, you will allow me, through the *Mining Journal*, to say that the country is a good one for mining, and parties interested in *bona fide* mines and practical management have no need to fear losing their money, or indeed, to take any notice of what is written in such a delusive spirit, for I am fully convinced that there is not a richer country in the world for minerals than Colorado is, and especially for silver and gold. For near four years I have been in that country, and have been through all the mines that are yet opened up, and have taken every means to ascertain their value, cost of working, &c.; and after allowing for all extra expenses in the working, I find the average yield of the lodes to be greater in value than in any other country, and with proper management would leave greater profits. There is no doubt the mines of Colorado have been very badly managed, in fact, there is not a mine that I have seen worked in a proper manner, neither is there a mine with the sole management in the hands of a practical man; and it is quite surprising to see how some of them are worked, and the waste of money incurred. But, Sir, this does not alter their value. Let parties who are investing their money in Colorado mines have the assistance of practical mining men to examine the lodes, and give their opinion of their prospects and value, and extent of ground, which should not be less than from 2000 to 3000 ft., then, with honest men, and proper working, we should not hear of any more complaints in the *Times*, or from the shareholders of fear of losing their money.

London, Oct. 4. H. B. Grose.

P.S.—Next week I will give you the names of some of the principal mines, length of ground, &c. ——

WITH WHAT ARE THE STRATA ABOUT PRODUCTIVE COPPER LODES MINERALISED?

Sir,—I have read with much interest the letter of your correspondent, Mr. Payne, on this subject, in the Supplement to last week's Journal, and quite agree with him as to the almost uniform vagueness of mining reports; and, as one of the class who occasionally write them, I confess for that class generally, although there may be exceptions, that from ignorance we are unable to give a reason for the hope that is in us of having a profitable mine at any given point. First, from our inability to describe satisfactorily the signs of promise we observe; secondly, from being unable to determine whether the quantity of elementary matter present in the strata is sufficient to warrant a belief in a remunerative lode or not; and, thirdly, from our utter inability to determine by chemical assay whether any or all of the necessary elements to the constitution of copper or any other mineral be present in the bounding strata. It is too late for me, but I most heartily agree with Mr. Payne that it is most desirable those in power should see that provision be made to supply this great want of a most important science in the art of mining, that our mining fields may maintain the position they demand in the future progressive industry of the world.

I have for many years known and occasionally met Mr. N. Ennor, and, although his manner was or is of a homespun article, and the want of an early education makes his notions appear crude and unpolished, there is, notwithstanding, in my opinion, very few men, however scientific, possessed of a more thorough knowledge of practical mineralogy applicable to ordinary mining than Mr. Ennor.

I agree with Mr. Ennor that all minerals grow and decay, as doth a tree—and, with Mr. Payne, that slides, elvans, cross lodes, and caunters, as well as strata and water, should not be lost sight of in determining the probability of success or otherwise in mining any given piece of ground, and particularly if the district be new. But there is a drawback to a specific determination in any case—the lode at any given point may be poor or good, according to the nature of the stratum in immediate contact therewith, while from the vertical dip of the strata in its layers or beds, or the divisional joints of the same lineally, the same lode, rich or poor here, may enter in length or depth strata of a more or less prolific nature. How is this to be determined—should we bore, as in the case of coal winning?

In answer to the question, "Would there be any yellow copper in a lode if the strata contained no sulphur?" I say—No; and the presence of arsenic is a sign of its decay. The composition of yellow copper is—copper, about 76; sulphur, 22; iron, 5. So it is clear that without these elements in the strata no yellow copper need be expected in the lode. But what are the relative quantities most desirable of each?—*Goginan, Aberystwith.* Richard Williams.

CORNISH MINING—MINERS' PAY.

Sir,—Perhaps you will allow a life-long resident in an important mining district, and one who has given the matter very serious attention, to offer a few remarks thereon, and more particularly to those who cannot be conversant with the peculiarities of mining affairs, and who too often judge certain doings by a standard applicable to almost every other calling but mining. I would start by saying that all underground operations are almost necessarily carried on by contact jobs, and cannot be by day-work without involving great difficulties. The complaint of our underground workers at the present time does not arise from this contract system itself, but from the mode most of our mine managers adopt in carrying it out. The crying evil seems to be what is known locally as the extent system, which is this in practice: A contract is let to a pare of men to drive or sink a certain distance at an agreed price; the job is accomplished (say) in a fortnight, which enables the mine captain to judge for the next setting what to give, so that the month's wages to each man shall not exceed, if possible, the standard of the mine. All inducement to work lustily the second half of the month is gone, for if the standard should be exceeded a reduction is sure to be made in the succeeding month, and the mine average scrupulously maintained (and, by-the-bye, this is not high enough). The change wanted by the men in every mine is, instead of taking at a certain price per fathom for a specified number of fathoms, to have a fair price in sight per fathom for a specified time, (say) one, two, or three months. If the ground goes in their favour they will then get more money, but then the mine gets explored so much the faster on the same agency and engine cost, and the object of the speculation is the sooner obtained. Should the ground turn harder than they calculated the miner must chance it for the term of his contract, with the hope that a better price will be given when next viewed by the agent, and the taking of a new contract. The men are quite willing to take all these chances, well knowing it is a venture throughout; and one great object will be gained by the adoption everywhere of this mode of working our mines—the lazy will be discovered (and I am sorry to say they are far too numerous), but their being so is mainly chargeable to the pernicious extent system which has so long prevailed, and the result has been that our really deserving and industrious miners, many of them highly intelligent, have moved away from the country to other lands, where no such absurd system is in vogue. Those mines who have

tried it see great benefit to all concerned. The time of payment, which is another very important question for our mining folks to think over, I must leave for another letter. OBSERVER.

MINING SPECULATION—BROKERS' ADVICE.

SIR,—In this selfish, grasping age, when the principle is everyone for himself and nobody for anyone else, it is most pleasant and refreshing to discover that a large class of our fellow-creatures have devoted themselves to the benevolent task of calling the attention of the public to the many golden opportunities of securing wealth, which are revealed alone to the initiated—the fraternity of Mining Brokers. Thus, one of the most distinguished and infallible of these vaticinating philanthropists, about three weeks since, informed the public, through your columns, that Eclipse shares ought to be sold and Taquaril shares bought, and that the knowing ones were doing so. An excellent report from Eclipse, and a most deplorable confession from Taquaril arrived shortly afterwards, much, it might be supposed, to the discomfiture of the benevolent and self-sacrificing oracle. Far from it. The indomitable Prophet returned to the charge on Sept. 30, in these memorable words:—"Eclipse is being bolstered up by market operators to rid themselves of a large number of shares. Taquaril, on the other hand, is being depressed for the purpose of buying up." Ere a single lustrum of days had elapsed after the appearance of this Solonic paragraph, another confession from Taquaril came to hand, setting the deplorable condition and prospects of that mine in so clear a light, that if the depression has been created (as the gold has not) for the purpose of buying up, it has been eminently successful, for a very little indeed would now buy up Taquaril. But the Zadkiel of whose predictions I write would reply—"Only believe me, and gold will abound at Taquaril, and vanish from Eclipse." The gnomes who dwell in deep gold mines are at the beck of the great prophetic seer, and will at his command enrich Taquaril and impoverish Eclipse, not for his sake, by no means, but for the sake of those who have faith in the words of wisdom that fall from his lips. Wheal Buller shares, said our oracle, should be sold: they were then at 28*l.* From want of faith alone they perversely proceeded to rise to nearly 40*l.* per share. Like other Zadkiels, our mining Zadkiel has once or twice made a lucky guess in his predictions, but even this has usually occurred when the coming event was already transparently obvious to the public. OZOKERIT.

Oct. 4.

THE TERRAS TIN MINE.

SIR,—Since my communication in last week's Journal I have had numerous letters, from brokers and others, advising me to escape from the rich lodes, elvans, &c., which abound in Terras, and only require time to amply remunerate the adventurers, one gentleman writing, when I told him what shares I had in it—"I presume you know what you are about. Buy Pedn-an-drea at 10*l.*, it will be a good dividend mine, and when will you get a dividend in Terras?" Another writes—"Sell out, it will only cause you a loss," and others still more alarmingly; but I have a rule of my own, and do not take the startle so hurriedly, so I have stuck to the young craft with more tenacious grasp, determined to see the best and the worst, and have got my friends to buy very largely. I have asked my advisers—Have you seen the Terras Mine or had an agent over it? Are there no tin lodes in the bowels of Terras? Are the promoters not capable of pushing on the mine with ample machinery to crush the tinstone, of which there is enough to keep it going for at least 100 years? And other equally pertinent questions.

As a result, I have received from some evasive answers, and from some no reply at all. In a word, I placed them in a dilemma from which they could not escape. It appears evident to me that it suits some dealers for adventurers to be constantly shifting about, forgetting that "a rolling stone gathers no moss;" but I would advise my brother adventurers to lend a deaf ear to all such suggestions.

If you will favour me by inserting these remarks I shall feel obliged. Terras will soon tell its own tale, and put all these wiseacres to the blush.

Ormiston, Tranent, Oct. 2. JOHN ADDISON.

THE MINES OF CARDIGANSHIRE, AND THEIR INEXHAUSTIBLE TREASURES.

SIR,—I notice, in the Supplement to the Journal of Sept. 16, a letter from Mr. Absalom Francis, referring to the different mines, and the manner in which they have been worked. Now, having been staying at Aberystwith for the past month, I have been enabled to make enquiries about the different mines in the district; and, from what I have gathered, I perfectly agree in a great measure with Mr. A. Francis that several of the mines have been badly managed, and worked on a scale that is termed "beating out time" just to get salaries. The little that I know about mining is that unless the shafts are kept going down and cross-cuts put out to prove side branches and lodes the mine must certainly come to a standstill. Now, I can speak without fear of contradiction that many of our best mines in England have been found productive the second time of working. It may be asked how this occurred? The reply is easy—because the former party neglected in sinking and cross-cutting the mine. It is an old saying among miners that cross-cutting is the art of mining.

Mr. A. Francis, although he speaks so highly of the mines in the Rheidol valley, leaves out the name of the one that stands most prominent in the district—that is, the Caegynon Mine. This mine was worked "beating out time" for many years, and done nothing until it got into the hands of the present party, who are working it with spirit and in a miner-like manner. What is the result?—by sinking and cross-cutting the lodes in the most promising parts, the mine is now in a position to make double the returns, nearly meeting the expenses, and it is confidently expected will be making profits at no distant date. I am not a shareholder in Caegynon, neither do I know the parties connected. I merely write this to give honour to whom honour is due. I am a large shareholder in many Welsh mines, and from what I see and gather from experienced men I believe there is a great reform wanted in the management of several mines.—*Devil's Bridge, Sept. 29.* A TOURIST.

GREAT NORTH LAXEY MINE.

SIR,—There has been some correspondence of late concerning the way in which Great North Laxey is worked, and I, for one, am glad to see "An Old Shareholder" has taken the matter up in the Journal of last week, as it behoves us to look after our property, the same (according to figures produced by him) not having been developed in depth as it should have been by such a man as Capt. Rowe—consequently, the shareholders' money disappears, and, until woke up by such members as "An Old Shareholder," directors of companies like this take things a little too easy. But my object in writing this is to ask the reason why meetings cannot be held half-yearly, once on the mine, and once in London, instead of yearly, as at present? The expense, surely, would not be so very great, and shareholders would then have an opportunity of visiting the mine, and ascertaining for themselves whether the capital was being satisfactorily spent or not. It is certainly rather mortifying to know that the mine might have been long ago made a paying one if it had been deepened a little more quickly, and rather less of the capital spent in stoping. Are the directors afraid to meet the shareholders in the face of this bad management? If not, why not meet them a little more frequently? As it is, directors and others of companies whose meetings are held yearly know very well that, once the meeting is over, they are safe from censure for the next twelve months, except through your columns, of which they take very little notice. ANOTHER SHAREHOLDER.

MINING IN MONTGOMERYSHIRE.

SIR,—In looking over the *Mining Journal* of last week, in the column of the Registration of New Companies, &c., I find amongst the different names that of the North Van put upon a piece of land known as the Gysalifa Farm, which has lately been taken up as a piece of mineral property. Now, I have taken a great extent of land in the immediate vicinity of the Gysalifa Farm, known as the Naladd-Llwyd Estate, and which lies to the west of and adjoining it, immediately to the north of the celebrated Van Mine, which name I gave to this property in September, 1870, and it appeared in the Journal at the time as the North Van Mine. Although there is nothing in a mine that could induce mineral to fall in and form itself into a mass, yet everyone likes to hold his own as long as he can. I consider, therefore, that the company formed for the working of the Gysalifa property, have borrowed a name for their mine without my consenting to it, or even without mentioning it to me or my friends in London. However, as I said before, there is nothing in a name, and I wish them every success, yet I may state that I consider the properties spoken of, whether called North Van or any other name, are not to be surpassed (with the prospects for the future) even by the Great Van itself. Indeed, it is very surprising that the lovely vale of Llawr-Glyn should have been idle so long, as it is the very next valley to the rich Van, the lodes of each mine running parallel with the other, and having all the rich mines of Montgomeryshire, rolling in wealth, immediately surrounding this quiet and lovely vale, down through which a beautiful and ever-flowing stream of pure water glides sweetly on until it enters the Severn. The mines spoken of (for I must speak well of them both) are about 2 miles up the river side from the little village called Tref-Eglws, the name of the parish in which the mines are situate. This village is close to a station now building on the New Van Railway; consequently, the furthest mine up the valley is within 3 miles of this new station, where there is plenty of water, plenty of timber, and plenty of labourers. Now, Sir, I do not boast or exaggerate, but tell you truly that I firmly believe a more certainly successful and promising property cannot be found throughout the county of Montgomery.

Rheidol Cottage, near Aberystwith. SAMPSON TREVETHAN,
Mining and Consulting Engineer.

THE ECLIPSE MINING COMPANY.

SIR,—I notice a letter, in last week's Journal, signed "A Shareholder," embodying (the letter, not the shareholder) some severe strictures upon the Eclipse Mine and its management. From the animus of the letter and the remarks it contains its signature might more properly, perhaps, have been "Bearholder;" but, whether it be "bear" or "share" holder, the writer appears wholly to ignore the very excellent and encouraging report from Mr. Henry Tregellas, dated Sept. 3, in which he says—"Let us hope the best; but, judging from the date of this letter, Sept. 27, there is still some screw loose." "A Shareholder" thus seems to have seen a letter from Mr. H. Tregellas, dated Sept. 27, which is the date of "A Shareholder's" letter. Quick work this, for a letter to arrive in England from California the same day it was written. The last letter received from Mr. Tregellas was dated Sept. 3, and if "A Shareholder" is really such, and not a mere "bear" holder, he would have seen that letter or report, and would have become aware how satisfactory it is. The stamps were all ready, and were to start on Sept. 25; and the tramway from the mine to the stamps was almost completed, and would save 8*s.* per ton upon the carriage of ore to the stamps, a saving of quite 6000*l.* per annum upon the cost of the year's supply of ore to the stamps. Moreover, the assay of the silver from the silver lode shows that the silver ore is exceedingly rich in gold—92½ ozs. of metal melted from the silver ore consisting of about 74 ozs. of silver and 18½ ozs. of gold, or for the respective values of the silver and gold about 20*l.* and 77*l.* worth, and the silver lode whence this was taken was not known when the company was formed, neither did its additional profits enter into the calculations of the returns, which were considered as about to arise from the gold lode alone.

There is no doubt that it was a great evil to buy and set up the 10 atmospheric stamps. Similar stamps had been tried in Cornwall, and had proved a failure. The water stamps ought to have been provided in the first instance, but "A Shareholder" need not rake up and recur to this blunder, which he cannot recal, and which has been fully compensated for by the erection of 42 suitable stamps, amply supplied with water power. It was no fault of Mr. Tregellas that the old mill was a failure, and if "A Shareholder" has read the reports of Mr. Tregellas, and especially his last report, dated Sept. 3, he ought to be only too glad that the Eclipse Company have such an able manager, and that such progress has been made in spite of the enormous difficulties the latter has had to contend with, and which even "A Shareholder" admits are serious.

There is, as "A Shareholder" observes, a screw loose somewhere, but not with the mine or its manager. The screw loose is in "A Shareholder," or "Bearholder," if such he be, being unable to appreciate a good mine and a zealous manager, and affecting to find fault with what he does not understand. The average yield of Eclipse ore is nearly 3 ozs. of gold per ton, whilst the prospective profits have been calculated upon a yield of half that quantity only. There is power to drive 100 stamps, and to the 42 already in place the remaining 58 can be readily connected, so that about 1000 tons per week of auriferous quartz can eventually be stamped, at a cost of not over $8 to $10 per ton; therefore, even if the ore should yield but 1 oz. of gold per ton, the profits will be enormous, sufficient to satisfy even "A Shareholder," whose holding in the mine must be small indeed, or he would hesitate to prejudice his own interests by carping and fault-finding without a cause. I conclude, however, that he is a "bear:" they abound in London as much as in the Rocky Mountains, and are as ready to tear and destroy.—*Oct. 3.* ZEPHYRS.

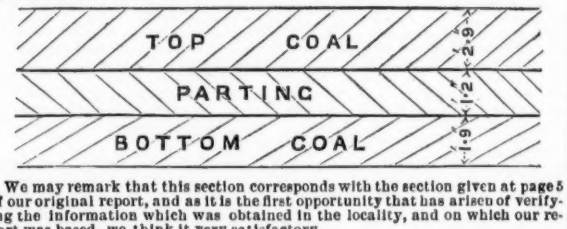
[For remainder of Original Correspondence see to-day's Journal.]

GNOLL COLLIERY COMPANY.

A satisfactory report has just been made on this property, and submitted to the directors, by Messrs. SHELFORD and ROBINSON, the managers. The important point is in the fact that already the anticipations of the managers are being realised—for instance, on Sept. 30 Mr. Robinson went into one of the old workings which had just been unwatered, and saw the Hard seam, which was found to be of good coal. Thus much has been accomplished of what had been aimed at—to prove the seams to be what Mr. Robinson had learned, from careful investigation, they were when last worked. The Hard seam proves to be precisely as Mr. Robinson indicated in his original report—hence the interest attaching to his examination of Sept. 30. The report is as follows:—

Oct. 3.—We beg to report that at the last visit which Mr. Robinson made to the colliery, on Sept. 30, he was able to examine the Hard vein of coal in one of the old workings out of the Greenway pit. We think this so important that we make you a special report on the subject as follows:—

The water at the time of this inspection had been lowered 96 ft. in No. 1 (or fire-engine) pumping pit, and Mr. Robinson examined this pit, and found it in very good preservation, and not requiring any expenditure to repair it. He next descended the Greenway pit, and found it also in a very good state of preservation. The sound condition of these old pits may be attributed partly to the Aberthaw lime with which the stone walling was probably built, and partly to the solid rock which was met at a few fathoms from the surface. The water in this pit measured 92 ft. from the top of the pit. Near the bottom an old working to the dip of the coal (towards the Fire-engine pits) was entered, and Mr. Robinson measured the seam of coal exposed in it, and found its section thus giving 4 ft. 6 in. of solid coal.



We may remark that this section corresponds with the section given at page 5 of our original report, and as it is the first opportunity that has arisen of verifying the information which was obtained in the locality, and on which our report was based, we think it very satisfactory.

Some of the coal has been tried, and pronounced of such excellent quality as to ensure its commanding a ready sale in Neath.

The present advanced state of the pumping operations will enable the upper seams probably to be reached to the dip in about a month's time, when the coal can be raised from No. 2 Fire-engine pit. It is not proposed to wind coal at first from the before-mentioned seam in Greenway pit, as the economical working of the colliery at the outset points to the winding being done from No. 2 pit, which is being enlarged for that purpose.—SHELFORD and ROBINSON, Managers.

VISIT TO THE SALT LAKE CITY, UTAH.

I find many changes in Salt Lake City since my last visit. Times are lively, and business of all kinds, especially of those branches connected with mining interests, is flourishing. I see many familiar faces from Nevada and all parts of the Pacific Coast, most of them evidently attracted here by the fame of the wonderful mines. The mineral producing qualities of the Territory are in nowise better proven than by the briskness in the business of crushing and sampling ores. Two new enterprises of this kind have lately been started, one of which is the—

SALT LAKE CITY SAMPLING MILLS.—Messrs. Geo. J. Johnson and Co., the proprietors, have a piece of land four blocks from the railway depôt, embracing an area of about 15,000 square feet. A 10-horse power engine is in use. They are fitted with a Forsman iron-clad stone mill, and one of Brodie's crushers, made by Hinkley and Co., of San Francisco. Ores are bought by these gentlemen that will average from $80 per ton and upwards. The dimensions of the building are 50 by 46 feet. In buying silver or gold ores the assays are all made by scorification. I called on Mr. J. B. Nichols, who is now experimenting with Krom's process of concentration, at Mr. Jenning's old tannery. This gentleman informs me that he has ordered six of Krom's concentrators from the East, which he expects shortly. These large-sized machines will run through from 20 to 30 tons of rock in 24 hours, and they will cost from $800 to $1000 each, delivered in Utah. They weigh 1200 lbs., are 4 feet high, and require a space of 3 by 6 ft. I saw one of the small sample machines in operation. The ore in passing through is freed of a large proportion of gangue matter, materially lessening the heavy expenses of transportation. By means of these machines ores falling below $50 per ton can be concentrated and shipped at a profit. I was shown plans of the buildings soon to be erected for the purpose of carrying on this enterprise.

At the works of Mr. H. S. Jacobs is a 16-horse power stationary Starkey's patent, which only occupies a space of 3 by 6 ft., and gives motion to a Dodge crusher and a re-grinding machine. The building is 86 by 30 ft., and fitted up with many conveniences for facilitating labour.

Seven furnaces are now running successfully in the Territory, and many new ones are in course of construction. It is estimated that there are now upwards of 10,000 persons engaged in mining enterprises, about one-half of them prospectors. I see hundreds of miners from Colorado, Nevada, California, and all parts of the Pacific Coast, which speaks well for the prospects of the country. Mills and furnaces in San Francisco, Chicago, Omaha, and Newark are supplied with ore from here. Large quantities are shipped to Swansea, England, the freight being only $7 per ton from New York, and returns are given in 60 days.

Reid's large building, in Main-street, is the head quarters of mining operators, and many well-known mining men have their offices here, including Messrs. Gould, of San Francisco; S. W. Howland, crushers and samplers; C. M. Stevenson, civil and mining engineer; and Woodhull Brothers.

In the windows are displayed fine collections of Utah ores, and the place presents a lively appearance between the hours of 10 and 4 o'clock, reminding a San Franciscan forcibly of California-street. The town is filled with transient visitors, who desire to see the "City of the Saints," and its numerous adjacent, and already famous, mines. The people of Utah are now constructing a railroad to run south through the Territory, which will be some 75 miles long. They intend running branch lines to the foot of the canons, in order to convey ore to Salt Lake City for shipment, and bring coal from the lower part of the Territory for the use of the smelting and reduction works. This road will be controlled by the Mormons, which shows that, at least, they desire to give encouragement to mining and railroading. There is a line of 6-horse Concord coaches running between Salt Lake City and Lake Point, connecting with the steamer City of Corinne, by which tourists are enabled to see the wonders of the scenery of this "Dead Sea of America." The time occupied in the run across, in both lake and river, is only 8 hours.

The Utah Central Railroad received for the week ending July 23 2,464,004 lbs. of freight, and shipped 1,605,419 lbs. Of this shipment 1,206,000 lbs. was bullion. Messrs. N. P. Woods and Co., forwarding and commission merchants, informed me that they shipped East and West, between May 15 and July 26, 12,269 sacks of ore, weighing 1,153,867 lbs., and 10,970 bars, weighing 1,223,300 lbs.

S. W. Howland and Co., crushers, samplers, and purchasers of ore, say that they shipped during the months April, May, and June from their crushing mills—

8	car loads of	20,000 lbs.	each	silver ore.
27	"	" 20,000	"	bullion.
21	"	" 20,000	"	copper.

Part of the silver and bullion went East, and all the copper came to San Francisco.

I learn from the *Tribune* that the mines and furnace belonging to Messrs. Bateman and Buell, in Bingham Canon, having been reported on favourably by Capt. Nancarrow and Mr. Henry Sewell, has been sold. The property was transferred to Capt. Nancarrow, as representative of an English company, called the Utah Mining Company. The amount paid for this property was $450,000 coin. It is a large and important transaction for Utah, and shows that the attention of English capitalists has been successfully called to the mines.—W. H. M.: *Scientific Press* (*U. S.*)

GOLD MINING IN NEW ZEALAND.

The information received from the gold fields to Aug. 10 is of a very favourable character, although there was a decrease in the returns of gold, as compared with the previous month. There was a great falling off, though fortunately it proved but temporary, in the yield of the Caledonian Mine, and the prospects were considered gloomy; but on July 19 a dividend of 3*l.* per share was declared, and the return for the fortnight's crushing, completed on July 22, amounted to 4253 ozs. Two days later a find took place, and the value of the shares nearly doubled. Magnificent stone was broken out, and during the week quite 6 tons of specimen stone of the richest character was brought to the surface and crushed, the result of the following fortnight's work being a 15*l.* dividend, while the reserve fund stands at 13,000*l.* Besides this, there is a large parcel of the richest stuff still uncrushed, so that the anticipation of another equally large dividend during the next fortnight is more than likely to be realised. These facts ought to be sufficient to create confidence, and to show that there was little foundation for the senseless rumours which previously so affected the market. That the mine is a wonderful one there can be no doubt, and it is difficult to make the public comprehend its richness. The amount of the dividends declared by this company since January last is 454,740*l.* (159*l.* per share), and the mine itself has turned out gold nearly to the extent of half a million sterling. We have referred thus at length to the Caledonian because by it the market is ruled, and on its permanence and richness so much depends with regard to other claims. The facts which we have given are sufficient to show that the mine has proved itself already to be the richest ever discovered. A new block of country, in a lower level than any hitherto worked on here, is now being opened up in this mine, and, as the rich run of gold strikes downward through it, there can be no grounds for anticipating any falling off. The claims in the immediate neighbourhood of this mine are looked upon with great favour, and will shortly, no doubt, prove equally rich. The Nonpareil and Central Italy Companies are each working on a reef supposed to be one and the same, and are likely to have some excellent returns.

At Coromandel the Tokatea range of hills still continues to afford incontestible proofs of the richness of the reefs with which it abounds, whilst the claims which are being worked nearer the shore are also on good stone. Unfortunately, however, there threatens at the present time to be more or less of a cessation of work, owing to the scarcity of blasting-powder. This is an item that cannot be done without, and that the supply has not kept pace with the demand is due to several causes, chief among which is the inadequacy of the accommodation which the Government has provided at the Thames for the safe stowage of the quantities required. Many of the machines, too, have been idle for some time past for want of coals. This also is owing to the supineness of the Government in not carrying out proper wharf extensions, alongside which vessels might unload in safety. When the fine weather sets in a great impetus will be given towards the prosecution of mining enterprise, and we shall probably have to record the discoveries of golden treasure further back in the hills than our miners have at present gone. Yet it must not be supposed that nothing is being done at Coromandel; for before the end of July the tramway had been so far completed that trucks could traverse the entire line; a few additions—strengthening the construction at the weakest points—will, after a short time, make the line very complete. Tokatea tailings, from the Whakaroa battery, are being delivered at the last station of the tramway, that adjoins the New Zealand Company's battery, the carriage being effected very successfully and expeditiously. This tramway will be the means of doing more for the future development of the mining interests at Coromandel than most persons can realise; the advantages of having such a communication through almost the two richest centres of the best known part of the field will, before long, be the means of discovering vast districts of hidden wealth. It is very gratifying to the constructors, as well as to the engineers, that the line is working so successfully and efficiently.

The principal mines appear to be raising quartz in good quantity, and the whole mining interest seems to be in a very buoyant condition. The fine Tokatea Mine raises stone in much larger quantities than the Whakaroa battery can crush. The management, however, have wisely agreed with Mr. Thomas, of the New Zealand Company's battery, to engage the entire of that powerful plant to the exclusive use of the Tokatea quartz; consequently the returns will be forthcoming regularly, and dividends paid to the shareholders in due course by this judicious arrangement. The Royal Oak, Excelsior, Peep-o'-Day, and Harbour View claims are turning out good stone daily. The Excelsior and Harbour View are expecting to crush immediately. The Christmas Box has just finished a crushing at the New Zealand battery of 31 tons, yielding 27 ozs. 4 dwts. The Tokatea No. 2 continues to push ahead their driving towards the Royal Oak leader. The French Republic, Count Von Bismarck, Bank of New Zealand, and several other claims, are progressing steadily. During the past few days the Conquering Hero claim has produced from the soft leader some of the prettiest and richest specimens of gold, in the form of solid branches, that could be desired. Stevens Morgan and party, working on a part of the old Kapanga ground, continue to find magnificent specimens of extraordinary richness, varying from 1 to 8 ozs. in weight, yielding half gold to half stone. The beach claims progress most satisfactorily. This part of the field, with also the older-worked portion on the hill sides, never were in the same prosperous condition as they are at present, and every month makes very great improvements. The coming summer is bound to unveil wonders at Coromandel.

The amount of wealth that is being realised out of the New Zealand gold fields may be judged of from a few very simple facts. The Coromandel gold field district, on the point of the peninsula, has a population of only 300 persons, yet at a single claim—the Tokatea—in one week they crushed 330 tons, the yield of only a few weeks, work, which gave 2256 ozs. of melted gold, which realised 2*l.* 18*s.* per oz., or nearly 6000*l.* From Harbour View, 23 tons yielded 218 ozs., at 2*l.* 16*s.* 6*d.* per oz.; and 200 tons are now being crushed for the Royal Oak and Excelsior claims, from which is expected 5 ozs. to the ton. The aggregate yield of gold for the month, 40,000 ozs., from 8000 tons of stone, or an average of 5 ozs. to the ton, is highly satisfactory, and marks New Zealand as pre-eminently ahead of any quartz mining gold field in the southern hemisphere. It is reported that Mr. James Farmer, of Auckland, member of the House of Representatives, has sold his interest in a very few claims at the Thames for 55,200*l.* sterling, and with accruing dividends that gentleman nets about 90,000*l.* sterling for a very nominal outlay.

RUDIMENTARY TREATISE ON GEOLOGY.—The character of the treatises comprised in Weale's Rudimentary Series (now published by Messrs. Lockwood and Co., of Stationers' Hall-court) is already well known to students in science; and the volume (the 173rd) just issued descriptive of Physical Geology, by Mr. RALPH TATE, F.G.S., will certainly not lessen the reputation of the series. The treatise is divided into 11 chapters, in which the author explains the meaning, object, and utility of the science of geology, and describes rock-forming

minerals, the effects of chemical forces on the earth's surface, the effects of aqueous forces, the effects of igneous causes, the movements in the earth's crust, lithology, the phenomena of rocks, the phenomena of springs, the order and arrangement of strata, and palæontology respectively. By the judicious subdivision of the several chapters the most systematic treatment of each portion of the subject is secured. The illustrations in the work are numerous and well executed, and the style, although concise, is sufficiently popular to ensure the book being studied with interest. All the information likely to be required upon the subject can readily be obtained from Mr. Tate's volume.

FOREIGN MINING AND METALLURGY.

The demand for coal has continued active in the Charleroi basin, notwithstanding that freights have advanced. The stocks accumulated are being reduced by the large deliveries made by water, but the want of rolling-stock on the Northern, the Eastern, and the Great Central Railways is still much felt, and greatly reduces the deliveries made. It is stated that the Great Central Belgian Railway Company proposes to construct shortly 1000 coal trucks; this is a piece of intelligence which has been received with much satisfaction by the coal trade. Coal has risen 5d. and coke has advanced 1s. 3d. per ton during the past month; a similar advance generally occurs, however, at this period of the year, as buyers, instead of giving out their orders at the commencement of the season, often wait until nearly the last moment. In the Centre coke for foundry purposes is quoted at 17s. 6d., and coke for blast-furnaces at 14s. 6d. to 15s. 6d. per ton. The condition of the coal trade in the Mons basin is represented as favourable, deliveries both by boat and railway being effected with activity. Trucks still make default upon the State railways, and industry continues to suffer from this cause. The trucks recently ordered by the administration of the State lines will also come too late to be of service during the present season. There is a scarcity of labour at some points of the Mons basin, and wages are advancing. There has been no diminution in freights, which remain at exorbitant rates.

The Belgian iron trade continues to enjoy a large measure of prosperity; prices are supported with firmness, and in some cases they are even advancing. Pig is readily disposed of, and rolled iron, plates, and iron for building purposes are in good demand. The demand for rails leaves something to be desired; at the same time, the rolling-mills are negociating for some important orders, and the proprietors are confidently anticipating favourable results. A new blast-furnace of the Marcinelle Metallurgical Company has just been brought into activity; it produces casting pig, which has been highly spoken of. The construction workshops, foundries, &c., are in full activity, although there are some complaints as to the want of labour. A strike which had taken place among the mechanics of Brussels has been satisfactorily adjusted, and operations are now proceeding regularly in all the workshops of the Belgian capital. An adjudication has just taken place of 1020 coal trucks for the Belgian State Railways. The work will be shared among 12 competing firms; the lowest tender for the trucks was 93*l.* and the highest 103*l.* each. These prices are somewhat higher than those which prevailed at the last similar adjudication; this is attributed to the fact that the Belgian Government waited before giving out the contract until the principal construction establishments were overdone with foreign orders, while it is not very long since that they would have been glad to welcome orders on home account. Orders for 24 locomotives for the Belgian State Railways have been shared among various works. It is rumoured that the Belgian Government will shortly let other contracts for locomotives and trucks; we reproduce the statement, however, "with reserve." It is stated that altogether no less than 4700 railway trucks and vans are now in course of construction at Belgian works. The Company for Working the Netherlands State Railways has let a contract for 1000 tons of rails; the lowest tender was that of the Sclessin Company, 7*l.* per ton, while the highest was that of the Marcinelle and Couillet Company, 8*l.* 19s. 6d. per ton. From the Luxembourg we receive intelligence of the lighting of two new blast-furnaces by the Eich Company. These furnaces are of very large dimensions, and are capable of producing 100 tons per day. The Monceau Blast-Furnaces Company has been paying this week a first dividend for 1871, or 1*l.* per 20*l.* share.

The items of news which have come to hand this week as to the state of the French iron trade are not of very great importance. In the Meurthe and the Moselle prices are firm. At Longwy, where seven blast-furnaces are in activity, and where two more will be blown in a few days, pig of ordinary quality is quoted at 3*l.* 2s. 6d. to 3*l.* 4s. per ton, while grey speckled pig has made 3*l.* 6s. 6d. to 3*l.* 8s. per ton. In the Nancy group prices range from 2*l.* 16s. 10d. to 2*l.* 18s. 6d. per ton. There is little fresh to report from St. Dizier, except a reduction in the price of coke-made iron, in consequence of the competition of iron from the department of the Nord, and apprehensions as to renewed competition from the Moselle; prices range at present from 8*l.* 4s. to 8*l.* 8s. per ton. The Customs treaty, just concluded, which adjourns the establishment of a commercial barrier between Alsace and France, has not had any marked influence upon the general condition of affairs. MM. de Wendel, who had been negociating for the purchase of the Gorcy Works, are stated to have abandoned the project, in consequence of the Alsace and Lorraine treaty, which they regard as rendering competition impossible. The Loire Mines Company will pay, on the 16th inst., its first dividend for 1871, or 3*s.* 4d. per share.

At Havre, Chilian and Peruvian copper in bars has made 69*l.* 8s. to 70*l.*; refined ditto in ingots, 77*l.* to 80*l.*; Peruvian minerals, 71*l.* to 72*l.* per ton. American marks continue almost completely to make default, and prices are nearly nominal. At Marseilles, Spanish has made 72*l.*; refined Chilian and Peruvian, 74*l.*; rolled red copper in sheets, 83*l.*; round ditto, 86*l.* per ton. In Germany affairs maintain a regular course, and prices remain for the most part without change. The stock of copper on hand in Germany is not very considerable. In Holland there has been no material variation in copper. The French tin markets have remained in rather a languishing state. Upon the German markets the article has been tolerably firm. Soft first fusion lead has been quoted at Havre at 18*l.* 16s. to 18*l.* 18s. per ton. At Marseilles lead in saumons, first fusion, has made 17*l.* 6s.; ditto, second fusion, 17*l.*; lead in shot, 20*l.* 8s.; rolled, and in pipes, 20*l.* Upon the German markets lead has been rather firmer. At Hamburg prices have also displayed a slightly upward tendency. In Germany zinc has been well supported. At Hamburg, however, this has not been the case.

FOREIGN MINES.

ST. JOHN DEL REY.—Morro Velho, Sept. 1: Morro Velho produce for the second division of August, 12 days, 4652 oits.; yield, 2·506 oits. per ton. Gaia produce for the second division of August, 12 days, 103 oits.; yield, 635 oits. per ton. The sinking in the new shafts in August has been—A shaft, 4 fathoms 3 in.; B shaft, 4 fms. 1 in. In a few weeks the pumping-power will be in operation in both shafts.

DON PEDRO.—Aug. 29: Produce: Weighed to date, 11,193 oits.; estimate for month, 14,193 oits.—Mine: Good general work taken from mine; box work not rich from No. 6 and Canoa; these fluctuations are common. The line gone through in driving the level north from the 25 cross-cut, now thought to be in connection with Canoa, has not been worked on since my last. The richest part was in the bottom of the level, and cannot be followed easily until sinking is again resumed. Upwards, towards stopes in Canoa, we may be enabled to work it when ground is sufficiently drained, but if we cannot do so with advantage it will be embraced by our stoping operations descending on the Canoa. We are finding that the ground at Maquiné is very slow to drain. Auriferous ground has been encountered in Bryant's level. When communication is opened to Hilcke's, necessary for ventilation, we shall extend on the lode, and be enabled to report more definitely on it. The middle adit is progressing, though very wet. At the adit level communications to Vivian's and Canoa are being pushed forward. At Tambor, in a sparry branch gone through in the cross-cut, a few samples taken showed a grain or two of gold, but of no present importance, unless richer ground is discovered in connection with it. A cross-cut will be extended some fathoms, and then we shall open on the branch. At Mato das Cobras nothing new.

GENERAL BRAZILIAN.—Aug. 28: Our operations generally continue to advance satisfactorily. Nothing has yet been discovered in new ground worthy of note. At St. Anna the shallow adit, No. 1, is progressing satisfactorily; the water issuing from the end is about the same, and this seems to be gradually draining Haymen's shaft and the old workings. Shallow adit No. 2 is also advancing. The old adit has been driven south-west, and a rise made to an old level for air; when the latter is cleared good ventilation will be obtained. Sinking Haymen's shaft was resumed on the 21st inst.; so far the Jacotinga is dry. At Itabira the middle adit is still in the clay. Moore's shaft is advancing fairly, but at shallow adit the progress is less, owing to the increased quantity of water issuing from the end, which is giving a little trouble. The weather is fine, and our surface operations are equally satisfactory. Stable and rancho are nearly completed. The stamping mill at St. Anna is far advanced. The stamping-mill at Itabira is progressing apace. The health of the establishment is not so good. Materials and provisions are abundant, and the force adequate for our requirements.

ANGLO-BRAZILIAN.—Aug. 29: Pitangue: Our greatest efforts are now directed to the sinking of the shaft in Francisco Antonio line, which will require six months' time to complete and cut gold, provided the measurements given by the old proprietors are correct. I have postponed the making of the new rezo, as I have great hopes of making the old one answer with a small outlay. This brought over the old wheel and stamps will enable us to try a few hundred tons of ore, and if favourable we can then take steps towards the erection of more permanent works.—Passagem: For the present Fundao and the deep adit are suspended; in fact, the force reduced to some 70 hands, all told. With this force, exclusively employed on Dawson's stopes, where we have several months' reserves, all above water, I purpose making a few experiments, both as to the mode of raising the ore and particularly the extraction of the gold.—General Operations: The average produce of the month's raising differs very little from that of last.

ROSSA GRANDE (Gold).—Aug. 28: The operations have been carried on satisfactorily since my last. The work for the pumping-machine at the Bahu Mine is advancing rapidly. The sump-shaft is down 3 fathoms below the adit, and holed into large excavations of old workings under water. The lode at the Cachoeira Mine is without noteworthy change. At Mina da Serra I am sorry to say that as yet we have not encountered the expected improvement we hoped to find in the quality of the stone; the level has been driven now above 30 fms. on the course of the lode, but during this distance we find the same very poor. At the Caco lode there is nothing new.

TAQUARIL (Gold).—Mr. T. S. Treloar reports for July that the explorations have been carried on vigorously day and night, but I am unable to report the discovery of anything new. Every point of any promise on the property is receiving attention, and, though results so far have not been encouraging, we are still led to hope that by perseverance matters will sooner or later mend. Everyone here is doing his utmost for the interest of the company; prosperity of the undertaking is the one and only aim in view, and the directors may rest assured that the best is being done for attainment of the same. The produce amounts to 406 oits., and has been obtained from 685 tons of stuff from various localities, thus giving an average yield of ·592 oits. per ton. A portion of the manganese formation adjoining stamping-mill has been passed through the stamps this month, and separations have been made of several parcels of mineral from the deep adit, Pinga d'Agua, workings on summit of hill eastward, and Ponte Grande jacotinga, but with no favourable results.—Mine: Details of ground excavated, and all other work performed, will be found in the accompanying report from mine captains. A small line was encountered in the early part of the month in the 21 fm. level westward upon the top lode, and some fair work for stamps was extracted therefrom, but the improvement was not sustained in descending. A cross-cut northward will be commenced next month from the horizon of the bottom of the old engine-shaft to explore other formations which are running parallel to the present two. These formations have been intersected at the shallow adit cast, but at that point they are not auriferous.—Surface: In addition to performance of the usual running work, two sets of concentrating tyes and strakes have been made and fixed—one at mouth of shallow adit for reduction of poor mineral before conveyance to stamps, and the other, as already mentioned, close to stamping mill. For the first division of August, it is stated that since his last all points at Ponte Grande and hill eastward, which have received fair trial and proved non-auriferous, have been suspended, and the hands dispensed with. We have, however, extensive explorations still in progress, both in the old mine and at surface. The stamping mill is kept supplied with stuff coming from former, and manganese formation before alluded to, but produce to date is without change for the better.

EBERHARDT AND AURORA.—The directors have received 38 bars of silver, value 9000*l.*

SILVER PLUME.—E. E. Burlingame, Territorial Assayer: I enclose you a certificate of assay of a piece of ore I personally took out of the Silver Plume lode. It comes from a vein about 2 in. wide, and is rich enough to make a fine average for the whole lode. It is, of course, a picked specimen, but quite a large lot of the same is in sight. Colorado Assay Office, Central City, Sept. 16: I hereby certify that the specimen of ore taken from Silver Plume lode, Griffith district, assayed for Prof. Charles S. Richardson, gave the following result:—Gold, none; silver per ton (2000 lbs.), 2188 ozs. 2 dwts.; coin value, $2844 53-100.

SOUTH AURORA.—The different works of this mine are carried on the same as stated in last report. The new tunnel started last week to tap the main body of ore under the old works is going ahead rapidly. The completion of the tunnel job will facilitate the working of the mine greatly.—Genesee: The South Aurora Company has a force of 22 men at work on this mine at present. The force was increased last week; all hands are working in good ore.—South Iceberg: From present appearances the South Aurora Company is the fortunate possessor of another good mine—the South Iceberg. A splendid body of ore was struck north of the Sparscam. An increased force of 16 men was put on last week; more men will be put on immediately.—*White Pine News*, Sept. 9.

PINTO (Silver).—Capt. Plater (Sept. 10) reports—"The mines continue to look well, and I am now raising about 25 tons per day, which I shall continue to do until the mill is ready to run."

UNITED MEXICAN.—Extracts from dispatch of Mr. Edward Hay, dated Guanaxuato, Aug. 22: Jesus Maria y Jose and Remedios: These mines continue to yield an adequate supply of ore for keeping the reduction works fully and profitably employed.—New Concern: Adit of San Cayetano: The cross-cut that was begun last month in a southerly direction has reached about 15 varas; in the last fortnight several strips of quartz, with pyrites, have been discovered, and the end shows a slight "ramaelo" (network of quartz rock, &c.), that seems to increase as we advance. The rock is not very hard, and to all other appearances very like the frente of the adit some weeks ago. This morning the look of the frente had improved; several strips of quartz intersect it in all directions, and for the last two days two of these hilos (threads of ore) have given out water. In the higher part of the end the hilos are especulose (shining quartz). In the end of the adit west, and at the lower part, water has begun to ooze out of the rells. Since my last report we cut what may prove to be a "contra natural" vein, under the following circumstances:—The hilo that went on increasing in breadth, and had reached a width of 6 inches, taking a downward direction towards the south, has now joined another strip of quartz, which began on the south side of the frente, and inclined to the north. They measure now, united, 1¼ vara in thickness. The rock we are driving through now, below the above-named vein, is entirely intersected with strips of quartz. At the foot of the frente a well defined wall of the vein dips boldly downwards, and the whole of the end on both sides of the vein is a complete network of quartz. This accumulation of new features in the end of the adit, and in that of the cross-cut, made me postpone the new work that was intended to have been begun to the east of the cross-cut, north of the shaft of San Antonio de la Ovejera, but I intend to resume the work next month. The distance driven in the Buenos Ayres ground in the month of July was 8 varas.

ANGLO-ARGENTINE.—Report for July: All our mining operations are progressing satisfactorily. The mine is opening out well. At the Manager we are breaking some splendid looking ores, which I believe to be highly auriferous; samples of some have been handed to the reduction officer for assay. At the North Mine Colonel the lode presents the same promising appearance, and a large quantity of ore is accumulating for the stamps. I think I may safely state that we shall have 5000 tons of ore awaiting the completion of the stamping-mill. All the other points are being pushed on with without any change calling for remark. The force is sufficient for our present requirements. The health of the establishment continues good.

BATTLE MOUNTAIN.—Capt. Richards, Sept. 14: Virgin: In the 73 ft. level north there has been no ground driven since last week, the men being engaged in putting a stope over the back for proof of the lode, which in places is composed of red oxide, green carbonate, and copper glance, and will open out fair quantity of stoping ground, and is a promising lode. In Truscott's winze, sinking in the bottom of the 73 north, the lode produces some good quality ore, and is a very promising character; depth, 25 ft. We shall now resume the driving of the 113 as soon as we can, the ore in Truscott's winze warranting the advance of this level, which will enable this ore ground being taken away at a fair advantage, and should the ore hold down at this point, and which it now promises to do, it will add very considerably to the value of the mine, being, as explained in my report of June 1 last, an entirely new shoot of ore. Pascoe's stope, in the back of the 37 ft. level, are producing some good quality copper ore. The stopes in the back of the 113 north, and south of Roach's winze, are producing well, and we shall get a good shipment of ore again this month if the lode continues as good as now. There was sent from the mines in last month 1136 sacks, weighing 71 tons 9 cwts. 2 qrs. 8 lbs.; also 864 sacks, weighing 46 tons 3 cwts. 2 qrs. 16 lbs.: total, 2000 sacks, 117 tons 13 qrs. 0 qr. 24 lbs. We are cross-cutting west in the 73 near the shaft in search of another portion of the lode, and with good promising ground for driving in. The ore raised during the week amounted to 670 sacks.

EXCHEQUER (Gold and Silver).—Sept. 11: Mr. Chalmers reports—"The stope from the upper tunnel turned out 8 tons of good ore; with another man I could have doubled this. The pay vein is now 2 ft. wide in the south face of this stope. It is now no longer a matter of doubt whether I can keep the mill running. I now know I can with a sufficient staff and means of transportation."

PESTARENA UNITED (Gold).—Pallanza, Oct. 4: 388 ozs. of gold obtained from 629 tons of ore for September.

LUSITANIAN.—Sept. 26: Palhal: The lode taken down in River's shaft is composed of quartz and mundic; this shaft is now squared to the 120.—Levels on Basto's Lode: The 150, west of Taylor's shaft, contains a lode worth 1½ ton of ore per fathom. In the same level east the lode is 2 ft. wide, composed of quartz and small strings of ore. The lode in the 140 east is 4 ft. wide, poor. In the 140 west the lode is 3 ft. wide, worth 1 ton per fathom. The 130 west is now into the slide lode, and we shall turn to drive on its course, about south-west. The north branch in the 120 east is 1 ft. wide, unproductive. In the 110, east of River's shaft, the lode is 1½ ft. wide, carrying stones of ore. In the 90, east of this shaft, the lode is 1 ft. wide, composed of schisto and black flookan. The lode in the 70 east is 8 ft. wide, composed of quartz, spotted with lead. In the 60 east the lode is 1½ ft. wide, containing a little ore. In the adit west of Perez' shaft the lode has a string in it, containing good stones of ore. The Mill lode at the 38, east of Taylor's, is 6 in. wide, composed of flookan. In the 38, west of slide lode, the branch is small, but shows some spots of lead and copper.—Winzes: No. 86, below the 90, contains a lode 2½ ft. wide, worth ½ ton per fathom. In No. 88, below the 28, the lode is small and unproductive.—Carvalhal: In the 60 cross-cut, north of incline-shaft, the ground is a hard gneiss.—Great Lode: In the 30, east of incline-shaft, the lode is 3 ft. wide, composed of good looking quartz and stones of lead. In the 20, east the lode is 6 in. wide, poor.—Caunter Lode: The lode is 6 in. wide in the adit west of incline-shaft, composed of quartz. In the 10 west the lode is 1½ ft. wide, containing mundic. In the 20 west the lode is split, and the north part 1 ft. wide, composed of quartz and carbonate of lead, and south part 10 in. wide, composed of quartz and mundic. In the 30 west the lode is 1 ft. wide, spotted with lead.

WEST CANADA.—Aug. 12: Wellington Mine: At Rowe's shaft the men are engaged putting in stulls, &c., preparatory to commencing a new stope west of shaft. The stope east of this shaft will yield as usual 2¼ tons per fm. The stope west is finished.—Huron Copper Bay: At the 60, east of Bray's shaft, the lode continues to look well, and will yield 2½ tons of ore per fm. We are driving a cross-cut at the 50, west of Palmer's shaft, to prove the north part of the lode. The 35, west of Bray's, on Fire lode, is now opening to main workings; the lode here is worth 2 tons per fm. The stope in the bottom of the 50, west of Palmer's shaft, yields about 2½ tons per fm.; ditto, in back of 50 east, yields 2½ tons per fm. The stope in bottom of the 50, east of Bray's, is suspended for the present. The stope in the back of the 35, west of Palmer's shaft, will yield 3 tons per fm.; and two stopes in the bottom of the 35, east of Bray's, 2½ and 3 tons respectively.

[For remainder of Foreign Mines see to-day's Journal.]

AUSTRALIAN MINES.

YUDANAMUTANA (Copper).—The superintendent, Adelaide, Aug. 14, states:—"I returned from the North on the 2d inst. after a stay of four clear weeks on the mine. The captain's report carries you up to the 7th inst., and embraces everything I could advise were I to give you a separate report." Capt. Terrel reports—Aug. 7, Blinman Mine: "The engine-shaft is down 45 fms.; in sinking the last 2 fathoms we cut a nice branch of yellow sulphuret ore, coated black. I then put the men to drive from Will's lode to hole to the shaft, and in driving we cut the same branch of ore just mentioned. As we shall have some difficulty in working upon this ore when we timber the shaft, I thought it better to put the men on to break it away at once. By the end of this month we shall be down to water level, when we hope to commence working Will's lode in earnest. In sinking the shaft we have opened up other good branches, which we have never seen before, and which make the mine look more promising. Last week I put a pare of men to work the lode we cut in driving from the 35 to the main shaft, and I am pleased to say the lode has improved very much; it is now about 3 ft. wide, of a good carbonate ore. Wood for smelting still comes in slowly, but we hope to have a better supply when the southern portion of the telegraph is completed, as there will be a larger number of drays out of employment. Ore raised and smelted, 191 tons; copper made, 12 tons 18 cwts.

PORT PHILLIP AND COLONIAL (Gold).—The quantity of quartz crushed during the four weeks ended July 19 was 4814 tons; pyrites treated, 37½ tons; total gold obtained, 1354 ozs., or an average per ton of 5 dwts. 15 grs. The receipts were 5090*l.*; payments, 3672*l.*; profit, 1418*l.*, added to which was last month's balance of 840*l.*, making an available balance of 2258*l.* The amount divided between the two companies was 1200*l.*, the Port Phillip Company's proportion being 780*l.* The balance of 1058*l.* was carried forward. The return for the three weeks ended Aug. 9 is—Quartz crushed, 3123 tons; pyrites treated, 20 tons; total gold obtained, 1035 ozs., or an average per ton of 6 dwts. 1 gr.; remittance, 800*l.*

— Telegram, dated Galle, Oct. 2, in anticipation of the mail leaving Melbourne, Sept. 10, and due here the 28th:—"Month ending Aug 16—yield per ton, 6 dwts. 15 grs.; fortnight ending Aug. 30—yield per ton, 4 dwts. 7 grs.; next fortnight better. Remittance, 800*l.*"

SCOTTISH AUSTRALIAN.—Sydney, Aug. 9: The sales of coal from the Lambton Colliery for the month of July amounted to 13,580 tons.

ENGLISH AND AUSTRALIAN (Copper).—Port Adelaide, Aug. 14: The smelting furnaces at Port Adelaide had been let out for stock taking, but there were two roasting furnaces and one refinery still at work for a short time. Since date of last advices a shipment of 50 tons of copper had been made; another 50 tons were in course of shipment, and a further 130 tons would be shortly ready for shipment. Mr. E. Cooke, accountant and sub-manager, writes that Mr. Hamilton, the manager, died, after a short illness, on July 30, thirteen days after the dispatch of the last mail. Mr. Cooke, who has been in the company's service for upwards of nine years, is conducting the affairs of the company until new appointments are made by the board. He writes that increased supplies of ore are coming in, that the make of copper for the year shows a considerable increase, and that all things were going on satisfactorily.

YORKE PENINSULA.—The directors have advances from the Committee of Inspection at Adelaide, dated Aug. 14, with reports from the Kurilla Mine to the 12th. The following are extracts from Capt. Anthony's report:—Hall's Shaft: The 45 is driven 10 fms. east of this shaft, and is now driving by six men, at 6*l.* per fathom. During the month the ground has been extremely hard, and less driven than I had calculated on. It is now rather softer, and also showing better for ore than at any past time. The 35 is driven 43 fms. east from the shaft, and is now driving by four men, at 6*l.* per fathom. The lode is 4 ft. wide, composed of quartz, carbonate of lime and iron pyrites, and yellow and black copper ore, of rich quality. During the past month a nice little "box" of ore has been passed through, and although the yield is at present small the lode has a most promising appearance. The driving of this level is now a matter of deep interest, being now 3 fms. further east than any other level, and in improved ground, as there are no other workings either above or below it. Should we cut a good depo-it of ore here we should have at once a new mine. The cost of driving is very little when the depth is considered.—Deeble's Shaft: The 25 is driven 25 fms. 4 ft. west of this shaft, and is now driving by four men at 7*l.* per fathom. The lode is large, and orey throughout. The last fathom has yielded 2 tons of superior yellow ore of 18 per cent. There is a change taking place in the entire character of this drive. For the last 8 or 9 fms. we have not been without ore, but although it has yielded large blocks of good solid yellow ore (some rocks weighing 2 cwts.), it has been for the most part confined to the bottom of the level, where paying ground is still in reserve. Last week the ore rose to the back of the level, leaving paying ground both in the back and bottom for future working. This, the south portion of the lode, seems to be narrowing, or, rather, is being displaced by the north part, which is not yet broken through, but it has every appearance of a permanent ore-bearing lode. The state of this level indicates very clearly the necessity of sinking Deeble's shaft below the present level to drain and render workable the ore ground in the bottom.—A telegram from Capt. Anthony, sent subsequently to the report from which the above extracts are given, states that he had bored a hole in the north side of the lode in the 25 west from Deeble's, into 2 ft. of hard yellow ore without meeting with a wall, and every appearance of permanency.

THE TIN TRADE.—Mr. W. van Houten (Rotterdam, Sept. 30) writes—The Tin Market has been without animation throughout the month, but closes with a very strong feeling. On the 28th inst. the 85,268 slabs offered in public sale by the Dutch Trading Company were sold as follows:—83,217 slabs Banca, at 77¾ fl. to 79 fl., average 78·80 fl., with a curtailment of 56 per cent. on the orders; 2051 slabs Billiton, at 78½ fl. to 78¾ fl. Banca has been in limited demand, at 79½ fl. to 79¾ fl. Ex the autumn sale a good business was done, at 78 fl. to 79 fl. Since the sale some transactions at 79½ fl. to 80 fl. were reported. Billiton has been in general request at 78 fl., while landing parcels changed hands at 77½ fl. Several lots of Billiton to arrive found buyers at 78 fl. The position of Banca tin in Holland on Sept. 30, according to the official returns of the Dutch Trading Company, was:—

	1871.	1870.	1869.
Import in September.....Slabs	4,246	9,139	20,844
Total nine months	100,120	138,990	63,880
Deliveries in September	9,000	6,226	10,439
Total nine months	116,191	91,165	74,572
Stock second-hand	118,717	48,546	70,948
Total stock	132,857	171,478	132,591
Stock of Billiton	3,051	4,000	10,714
Import in September	—	4,000	8,075
Delivered and shipped in Sept.	3,550	1,693	3,475
Quotation { Banca	80½ fl.	74½ fl.	78½ fl.
Sept. 30 { Billiton	79½	73½	77½

These returns, compared with those of 1870, exhibit—A decrease of the import for September of 153 tons, a decrease of the import for the nine months of 1215 tons, an increase of the deliveries for September of 87 tons, an increase of the deliveries for the nine months of 782 tons, an increase of the stock second-hand of 2130 tons, a decrease of the unsold stock of 3400 tons, a decrease of the total stock of 1207 tons, and an advance of the quotation of Banca equal to 10*l.* per ton. The quantity of Banca tin now afloat for the Dutch Trading Company is 7450 peculs, equal to 466 tons, against 18,100 peculs, equal to 1131 tons last year. We estimate the quantity of Billiton tin now afloat at 5971 peculs, equal to 373 tons, against 10,271 peculs, equal to 642 tons last year. The Government returns for the month of July are as follows:—

EXPORT OF TIN FROM HOLLAND.

	July.			Seven months.		
	1871.	1870.	1869.	1871.	1870.	1869.
Germany ..Tons	213	141	158	1784	1195	1653
England	79	205	49	870	984	338
Belgium } France }	350	97	104	1011	1513	945
Hamburg	99	11	9	137	72	60
United States	—	—	—	3	51	18
Other countries..	81	20	72	318	162	119
Total ..Tons	743	474	392	4123	3977	2553

COPPER.—J. Pitcairn Campbell and Co. (Liverpool)—Since our last 780 tons bars, on the spot and to arrive, sold at 67*l.* 10s. to 69*l.*, and 545 tons regulus, on private terms, to arrive at Swansea. Arrivals here during the fortnight of West Coast S.A. produce—Patagonia, from Valparaiso, with 204 tons bars and 300 tons ingots. At Swansea—Hercules, from Caldera, with 180 tons ore and 19 tons bars; Coronel, from Carrizal, with 604 tons regulus; Glanaila, from Carrizal, with 605 tons regulus. Stocks of copper (Chilian and Bolivian) in first and second hands, likely to be available, are—

	Ores.	Regulus.	Bars.	Ingots.	Barils.
Liverpool	798	1515	8,290	1-23	240
Swansea	3045	500	3,354	167	222
Total	3843	6515	11,644	1690	462

Representing about 17,400 tons fine copper, against 21,700 tons fine copper, Sept. 30, 1870; 16,500 tons Sept. 30, 1869; 8400 tons Sept. 30, 1868.

COAL TRADE.—Mr. J. R. Scott, the Registrar of the London Coal Market, has published the following statistics of imports and exports of coal into and from the port and district of London by sea, railway, and canal during September, 1871:—

By Sea.	Ships.	Tons.
Newcastle	202	118,873
Seaham	13	3,673
Sunderland	78	44,935
Middlesborough	12	4,830
Hartlepool	71	21,885
Scotch	12	3,331
Welsh	8	2,087
Yorkshire	33	3,360
Small coal	1	225
Cluders	5	537
Total	435	203,736
Imports in Sept., 1870.	459	221,141

By Railway and Canal.	Tons cwt.
London and North-Western	60,515 0
Great Northern	63,707 0
Great Western	23,563 0
Midland	117,668 0
Great Eastern	53,085 0
South-Western	1,927 11
Brighton and South Coast	0 0
South-Eastern	730 7
Grand Junction Canal	1,810 15
London, Chatham, & Dover	—
Total	327,594 13
Imports in Sept., 1870	307,918 12

Comparative Statement, 1870 *and* 1871.

By Sea.	Ships.	Tons.
Jan. 1 to Sept. 30, 1871	4215	1,982,784
Jan. 1 to Sept. 30, 1870	4731	2,152,390
Decrease in pres. year.	516	169,606

By Railway and Canal.	Tons. cwts.
Jan. 1 to Sept. 30, 1871	3,245,586 15
Jan. 1 to Sept. 30, 1870	2,722,024 1
Increase in present year.	523,562 14

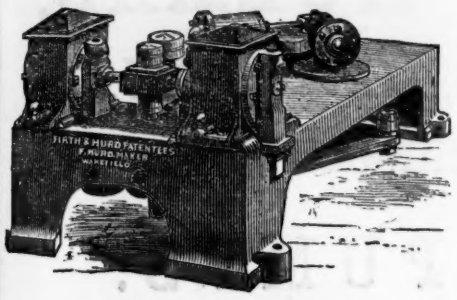
F. HURD, ENGINEER,

MILLWRIGHT, MACHINIST,

BRASS AND IRON FOUNDER,

ALBION FOUNDRY,

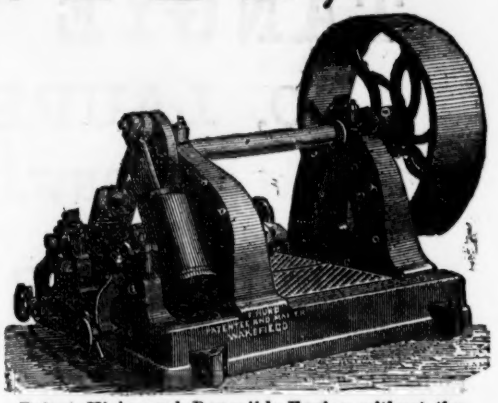
WAKEFIELD.



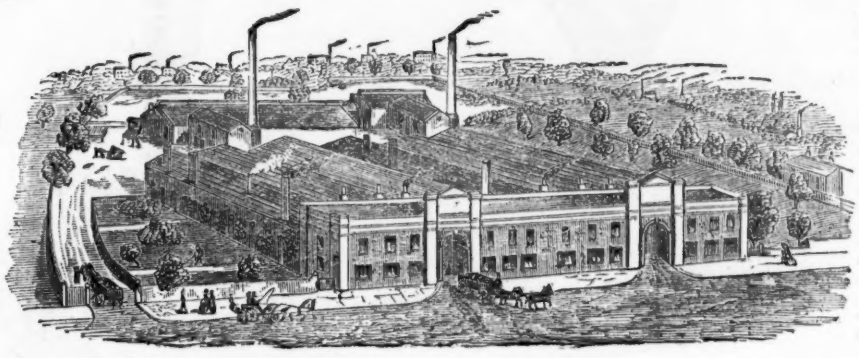
Patent Air-Compressing Engine.

MANUFACTURER
Of PATENT MINING and EXCAVATING MACHINERY.

FIRTH'S PATENT CANNEL HUB DRESSER.

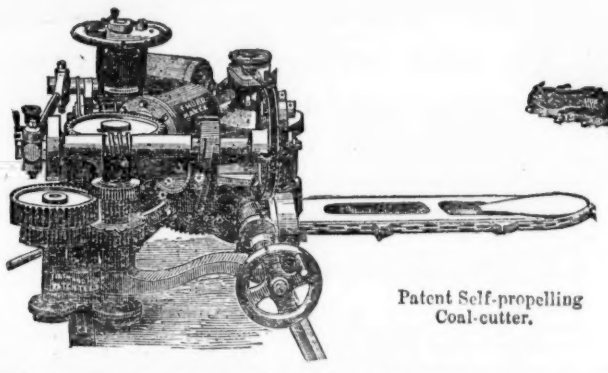


Patent High-speed Reversible Engine, without the aid of Tappets, Cams, or Eccentrics. Cylinders either fixed or oscillating.

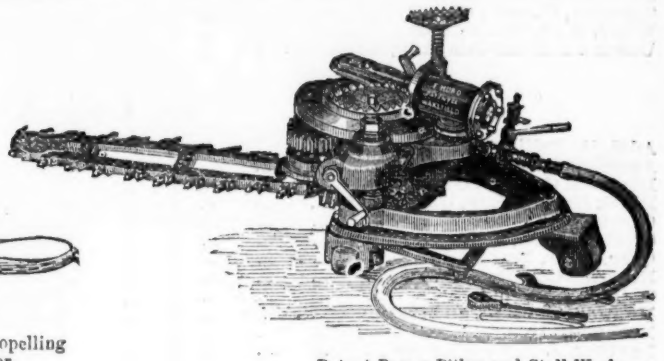


HYDRAULIC and AIR-COMPRESSING MACHINERY. Heavy, Light, and Ornamental CASTINGS, and Patent WORSTED MACHINERY.

Patent Power, or Hand Straight Work Coal-Cutting Machine.



Patent Self-propelling Coal-cutter.



Patent Power Pillar-and-Stall Work Coal-Cutting Machine.

Also, FIRTH'S PATENT ECONOMIC PERMANENT RAILWAY, without the aid of Pins, Bolts, or Wedges, that can be laid by an ordinary labourer with rapidity.

GENERAL CONTRACTOR; and Estimates given for Air-Compressing Machinery and Coal-Cutting Machinery on application.

AWARDED TWENTY GOLD AND SILVER FIRST-CLASS PRIZE MEDALS.

IMMENSE SAVING OF LABOUR.

TO MINERS, IRONMASTERS, MANUFACTURING CHEMISTS, RAILWAY COMPANIES, EMERY AND FLINT GRINDERS, McADAM ROAD MAKERS, &c., &c.

BLAKE'S PATENT STONE BREAKER,

OR ORE-CRUSHING MACHINE,

FOR REDUCING TO SMALL FRAGMENTS ROCKS, ORES, AND MINERALS OF EVERY KIND.

This is the only machine that has proved a success. This machine was shown in full operation at the Royal Agricultural Society's Show at Manchester, and at the Highland Agricultural Society's Show at Edinburgh, where it broke 1½ ton of the hardest trap or winstone in eight minutes, and was AWARDED TWO FIRST-CLASS SILVER MEDALS.

It has also just received a SPECIAL GOLD MEDAL at Santiago, Chili.

It is rapidly making its way to all parts of the Globe, being now in profitable use in California, Washoe, Lake Superior, Australia, Cuba, Chili, Brazil, and throughout the United States, and England. Read extracts of testimonials:—

The Parys Mines Company, Parys Mines, near Bangor, June 6.—We have had one of your stone breakers in use during the last 12 months, and Capt. Morcom reports most favourably as to its capabilities of crushing the materials to the required size, and its great economy in doing away with manual labour.

For the Parys Mining Company.

H. R. Marsden, Esq. JAMES WILLIAMS.

Acton Emery Works, Manchester.—We have used Blake's patent stone breaker made by you for the last 12 months, crushing emery, &c., and it has given every satisfaction. Some time after starting the machine a piece of the moveable jaws about 20 lbs. weight, chilled cast-iron, broke off, and was crushed in the jaws of the machine to the size fixed for crushing the emery.

H. R. Marsden, Esq. THOS. GOLDSWORTHY & SONS.

Alkali Works, near Wednesbury.—I at first thought the outlay too much for so simple an article, but now think it money well spent. WILLIAM HUNT.

Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stone and quartz. WM. DANIEL.

Our 15 by 7 in. machine has broken 4 tons of hard winstone in 20 minutes, for fine road metal, free from dust.

Messrs. ORD and MADDISON,
Stone and Lime Merchants, Darlington.

Kirkless Hall, near Wigan.—Each of my machines breaks from 100 to 120 tons of limestone or ore per day (10 hours), at a saving of 4d. per ton.

JOHN LANCASTER.

Avoca, Ireland.—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour. WM. G. ROBERTS.

General Frémont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or $75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.

Your stone breaker gives us great satisfaction. We have broken 161 tons of Spanish pyrites with it in seven hours. EDWARD AARON,
H. R. Marsden, Esq. Weston, near Runcorn

For illustrated catalogue, circulars, and testimonials, apply to—

H. R. MARSDEN, SOHO FOUNDRY,

MEADOW LANE, LEEDS,

ONLY MAKER IN THE UNITED KINGDOM.

TANGYE BROTHERS AND HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON,

CORNWALL WORKS (TANGYE BROTHERS), BIRMINGHAM,

SOLE MAKERS OF

THE "SPECIAL" STEAM PUMPS.

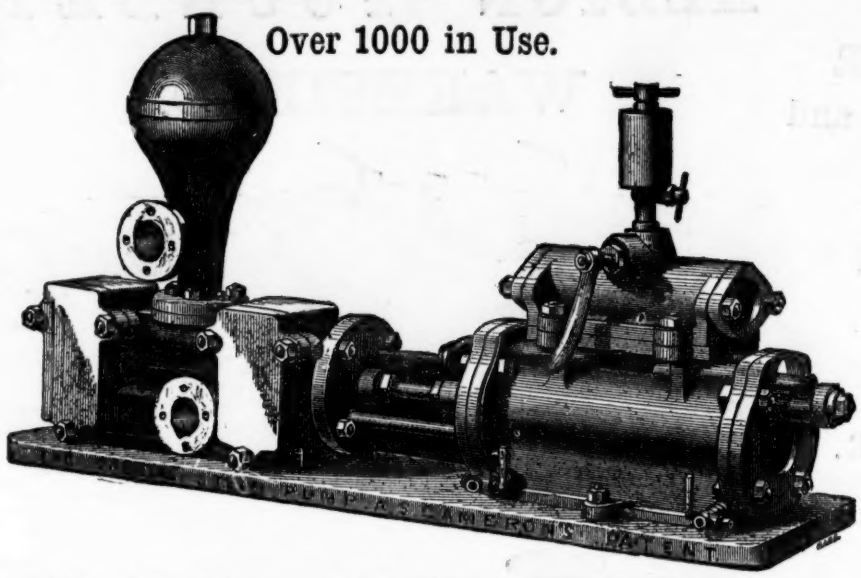
IN USE AT THE FOLLOWING QUARRIES:—

Carnarvon and Bangor Slate Co. ...	5	Pumps.
Kellow, J. E., North Wales Slate Co...	1	„
New Zealand Quartz Crushing and Gold Mining Company...	1	„
Scott, R. W., Dungannon, Ireland ...	1	„
Foster, J. S., Hebburn Quarries ...	1	„

IN USE AT THE FOLLOWING CHEMICAL WORKS:—

Alum and Ammonia Co., Bow Common	2	Pumps.
Barnes, W. C., Hackney Wick... ...	2	„
Burt, Boulton, and Hayward, Tar Works, Millwall	1	„
Cory and Co., Manor-street, Old Kent-road	2	„
Whiffen, Thomas, Battersea	1	„
Jones, W., and Co., Middlesborough...	4	„
Jarrow Chemical Co., South Shields..	1	„
Richardson, J. G. and N. H., Jarrow-on-Tyne	1	„
Read, Holliday, & Sons, Huddersfield	1	„
Sheldon, Nixon, and Co., West Jarrow	2	„
Tennant, C., and Co., near Newcastle.	7	„
Webb, H., & Co. (Manure), Worcester	1	„
Union Chemical Company, Stratford..	1	„

Over 1000 in Use.



NOTE.

Requires NO Shafting, Gearing, Riggers, or Belts.

All Double-Acting:

Works at any Speed, and any Pressure of Steam.

Will Force to any Height.

Delivers a constant stream.

Can be placed any distance away from a Boiler.

Occupies little space.

Simple, Durable, Economical.

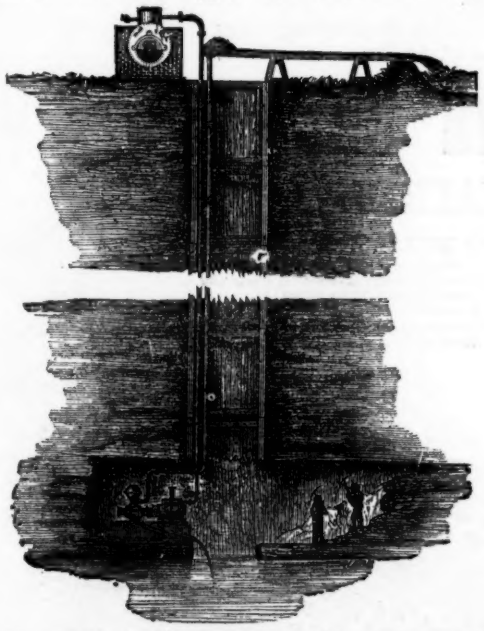
IN USE AT THE FOLLOWING COLLIERIES:—

Adelaide Colliery, Bishop Auckland ...	...	3	Pumps.	North Bitchburn Colliery, Darlington ...	...	2	Pumps.	Stott, James, and Co., Burslem	...	1	Pump
Acomb Colliery, Hexham	...	1	„	Newton Cap Colliery, Darlington...	...	1	„	Seaton Delaval Coal Company, near Newcastle		1	„
Blackfell Colliery, Gateshead ...	...	1	„	Normanby Mines	...	1	„	Thornley Colliery, Ferryhill	...	1	„
Black Boy Colliery, Gateshead ...	...	1	„	Oakenshaw Colliery	...	1	„	Thompson, John, Gateshead	...	2	„
Castle Eden Colliery	...	2	„	Pease's West Colliery	...	2	„	Trimdon Grange Colliery	...	1	„
Crofton, J. Ct., near Ferryhill ...	...	1	„	Pease, J. and J. W., near Crook ...	...	5	„	Tudhoe Colliery	...	4	„
Carr, W. C., Newcastle	...	4	„	Pease, J. and J., Brandon Colliery ...	...	1	„	Vobster and Mells Colliery	...	2	„
Etherley Colliery	...	1	„	Pegswood Colliery, near Morpeth ...	...	2	„	Widdrington Colliery, Morpeth	...	2	„
Gidlow, T., Wigan	...	3	„	Pelton Fell Colliery	...	1	„	Whitworth and Spennymoor Colliery ...	...	3	„
Haswell, Shotton, and Easington Coal Co.	...	2	„	Railey Fell Colliery, Darlington ...	...	1	„	Westerton Colliery, Bishop Auckland ...	...	1	„
Lochgelly Iron and Coal Company ...	...	1	„	Right Hon. Earl Durham, Fence Houses	...	1	„	Wardley Colliery, Gateshead ...	...	1	„
Leather, J. T., near Leeds	...	2	„	Skelton Mines	...	1	„	Westminster Brymbo Coal Company ...	...	2	„
Lumley Colliery, Fence Houses	...	1	„	South Benwell Colliery	...	4	„	Weardale Coal and Iron Company ...	...	5	„
Monkwearmouth Colliery, Sunderland...	...	1	„	St. Helens (Tindale) Colliery	...	1	„				

IRONWORKS AND ROLLING MILLS:—

Bede Metal Company, Jarrow	...	11	Pumps.	Gilkes, Wilson, Pease, and Co, Middlesboro'..	2	Pumps.	Whitwell and Co., Stockton	...	3	Pump
Bagnall, C. and T., Grosmont Ironworks	...	2	„	Lloyd and Co., Middlesborough	...	1	„	Whessoe Ironworks, Darlington	...	1	„
Consett Ironworks	...	2	„	Solway Hematite Iron Company, Maryport	...	1	„	West Cumberland Hematite Iron Company	...	1	„
Castleford Foundry Company, Normanton	...	1	„	Vaughan, Thomas, Middlesborough ...	...	2	„	Westbury Iron Company	...	1	„
Ellen Rolling Mills, Maryport	...	1	„	The Shotts Iron Company, Edinburgh ...	...	1	„				

THE "SPECIAL" STEAM PUMP AS APPLIED FOR DRAINING MINES.



The arrangement in the accompanying illustration shows an economical method of draining mines without the expense of erecting surface-engines, fixing pump-rods, or other gearing. A boiler adjacent to the pit's mouth is all that is necessary on the surface; from thence steam may readily be taken down, by means of a felted steam-pipe, to connect the pump with the boiler. The pump may be placed in any situation that may be convenient for working it, and connecting the steam, suction, and delivery pipes.

These engines can be fixed and set to work in a comparatively short time, and also at a very small outlay. They are used in large mines as auxiliary engines, and will be found invaluable adjuncts in all mining operations.

To estimate the quantity of water to be raised by any given size of pump refer to the tabulated list below. It is recommended to use long-stroke pumps where the height exceeds 100 ft., so that the largest result may be obtained with a minimum wear and tear of the pump pistons and valves. The pumps are provided with doors for ready access to all working parts.

PRICES OF THE "SPECIAL" STEAM PUMPS.

Diameter of Steam Cylinder .....inches	2½	3	4	4	6	6	6	7	7	7	8	8	8	8	10	10	12	12	14	16	26
Diameter of Water Cylinder ....inches	1¼	1½	2	4	3	4	6	5	6	7	4	6	7	8	6	7	8	10	8	7	6½
Length of Stroke ....inches	6	9	9	12	12	12	12	12	12	12	12	12	12	18	12	12	18	24	48	24	72
Strokes per minute	100	100	70	50	50	50	50	50	50	50	50	50	50	35	50	50	35	—	—	—	—
Gallons per hour	310	680	815	3250	1830	3250	7330	5070	7330	9750	3250	7330	9750	13,000	7330	9750	13,000	—	—	—	—
PRICE.....	£10	£15	£20	£35	£30	£40	£47 10	£50	£52 10	£57 10	£50	£55	£65	£85	£70	£80	£100	—	—	—	—

IF BRASS LINED, OR SOLID BRASS OR GUN-METAL WATER CYLINDERS, WITH COPPER AIR VESSELS, EXTRA, ACCORDING TO SIZE.

Any Combination can be made between the Steam and Water Cylinders, provided the Lengths of Stroke are the same, thus—8 in. Steam and 3 in. Water, or 10 in. Steam and 3 in. Water, adapted to height of lift and pressure of steam, and so on.

TANGYE BROTHERS & HOLMAN, 10, Laurence Pountney-lane, London, E.C.

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